

**Research project on Renewable Energy**

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**Draft**

Research project would ideally be a relatively short study with a suggested length of 20-30 pages including:

- introducing the relevance of the topic and giving general aspects of the topic;

- giving hints to best practice governance, resources etc.;

- sharing the audit related work done in the respective field.

The research project does not give guidance nor introduce necessarily how to audit the topic. This is generally elaborated in guidance documents. *(WGEA, Guide for Project Leaders: How to Develop a Research Paper or a Guidance Material in Environmental Auditing, 2011).*

# Foreword

Under the Goal 1 (Up-date existing and develop new guidance materials available to SAIs, conduct research studies on emerging topics in environmental auditing) of its 2014-2016 work plan, the ITNOSAI WGEA planned the achievement of six research studies on:

* Renewable energy
* Energy savings
* Environmental assessments
* Marine environment : Auditing government responses to a marine environment impacted by climate change: Creative and innovative strategies used by SAIs
* Market based instruments for environmental protection and management
* Greening the Supreme Audit Institutions
* How to increase the quality and impact of environmental audits

INTOSAI WGEA encourages its members to promote the importance of sustainable energy, which is defined as energy which in its production or consumption has minimal negative impact on human health and the healthy functioning of ecosystems, including the global environment, and that can be supplied in a sufficient amount not only to present, but also to future generations without putting a burden on them (INTOSAI WGEA, 2010).

On the other hand, increasing uses of energy produce increasing emissions of anthropogenic greenhouse gases. One way to reduce greenhouse gas emissions is to replace energy from fossil fuels by energy from renewable sources. Renewable energy technologies are clean sources of energy that have a much lower environmental impact than conventional energy technologies. In addition, broader use of renewable energy resources may help countries to alleviate their dependency on energy imports (INTOSAI WGEA, 2010).

Despite its advantages, renewable energy contributes only 13 %, in 2010, of total global primary energy supply (OECD, 2013). In 2012, renewable energy provided an estimated 19% of global final energy consumption (REN21, 2014). Many countries face some obstacles to developing their renewable energy sector. The major obstacles are inherent to the institutional framework, the absence of effective policies to boost renewable energy technologies and the financing difficulties.

These challenges highlight the need for Supreme Audit Institutions (SAIs) to focus on this area. Thus, it is important for SAIs to implement an effective framework for auditing Renewable energy in the aim to help governments and other stakeholders to promote the development of this sector.

As objectives, this research project intends to help SAIs seeking to review their governments’ energy policies by:

* Providing comprehensive data and information on renewable energy, including information about government policies and funding for effective technology development;
* Providing information regarding renewable energy audit topics and examples and case studies of best practice in this field.

Accordingly, the first stage of the project will identify the challenges faced by governments in developing renewable energy and how governments successfully responded to them and explore the types of instruments governments use to enhance the development of renewable energy.

The second stage of the project will gather SAI experience of auditing how well these policy instruments work, through the use of case studies. The case studies will provide SAIs examples of audit works of the SAIs.

**Table of contents**

[Foreword 3](#_Toc423534049)

[Acronyms and abbreviations 7](#_Toc423534050)

[List of figures 7](#_Toc423534051)

[Executive Summary 7](#_Toc423534052)

[Chapter I: Introduction and Background 8](#_Toc423534053)

[1.1. Concepts and definitions 8](#_Toc423534054)

[1.2. Why renewable energy 9](#_Toc423534055)

[1.3. Types of Renewable energy resources 9](#_Toc423534056)

[1.3.1. Wind Energy 9](#_Toc423534057)

[1.3.2. Solar Energy 10](#_Toc423534058)

[1.3.3. Biomass Energy 12](#_Toc423534059)

[1.3.4. Geothermal Energy 13](#_Toc423534060)

[1.3.5. Marine Energy 13](#_Toc423534061)

[1.3.6. Hydraulic Energy 14](#_Toc423534062)

[1.4. The benefits and the uses of renewable energy worldwide 15](#_Toc423534063)

[1.4.1 Renewable energy supply 15](#_Toc423534064)

[1.4.2 Renewable energy as an alternative to mitigate pressure on fossil energy 15](#_Toc423534065)

[1.4.3 Impact of renewable sources on the environment and global society 16](#_Toc423534066)

[1.5. Limitations to the development of renewable energy 16](#_Toc423534067)

[1.5.1. Cost limitations 16](#_Toc423534068)

[1.5.2 Technical constraints 17](#_Toc423534069)

[1.5.3. Institutional constraints 18](#_Toc423534070)

[1.5.4. Subsidies for non-renewable 18](#_Toc423534071)

[1.5.5. Geographical/natural conditions of specific countries 19](#_Toc423534072)

[Chapter II: Policies and governmental response to renewable energy challenges 21](#_Toc423534073)

[2.1. Institutional and regulatory aspects 21](#_Toc423534074)

[2.1.1. National legislation 21](#_Toc423534075)

[2.1.2 Policies and/or programs taken by governments worldwide for promoting and enforcing the renewable energy 21](#_Toc423534076)

[2.1.3 Support to R&D and reduction of production costs 27](#_Toc423534077)

[2.2. Incentive mechanisms and market based instruments 30](#_Toc423534078)

[2.2.1 The purchase rate 31](#_Toc423534079)

[2.2.2 Green certificates: 31](#_Toc423534080)

[2.2.3 Electric utility quota obligation/renewable portfolio standard (RPS): 31](#_Toc423534081)

[2.2.4 Tax incentives 32](#_Toc423534082)

[2.2.5 The list of state subsidies for renewable energy resources 32](#_Toc423534083)

[Chapter III: Role of international cooperation in the development of renewable energy 37](#_Toc423534084)

[3.1. Legislation aspects and mobilization of funding 37](#_Toc423534085)

[3.2. The international climate policy (the importance of international cooperation in using renewable energy sources and developing technologies) 37](#_Toc423534086)

[3.3. Clean Development Mechanism (CDM) 39](#_Toc423534087)

[Chapter IV: Auditing renewable energy 39](#_Toc423534088)

[4.1. Overview about auditing RE practices 39](#_Toc423534089)

[4.2. Audit topics on renewable energy 41](#_Toc423534090)

[Topic 1: Public policy on the use of Renewable Energy Sources Potential 41](#_Toc423534091)

[Topic 2: Relevance of public programs and projects on renewable energy 42](#_Toc423534092)

[Topic 3: Efficiency and effectiveness of measures to promote production and consumption energy from Renewable Sources 42](#_Toc423534093)

[Topic 4: Linking the use of Renewable energy impact and climate change plan 43](#_Toc423534094)

[Appendices 44](#_Toc423534095)

[Appendix I: Setting up and / or strengthening national legislation (survey results) 44](#_Toc423534096)

[Appendix II : SAIs case studies 48](#_Toc423534097)

[References 87](#_Toc423534098)

[Websites 88](#_Toc423534099)

# Acronyms and abbreviations

# List of figures

# Executive Summary

# Chapter I: Introduction and Background

## 1.1. Concepts and definitions

Renewable energy is energy that comes from resources that are naturally renewed on a human time scale such as sunlight, wind, rain, tides, waves and geothermal heat. They replaces conventional fuels in four distinct areas: [electricity generation](http://en.wikipedia.org/wiki/Electricity_generation), [hot water](http://en.wikipedia.org/wiki/Solar_hot_water)/[space heating](http://en.wikipedia.org/wiki/Space_heating), [motor fuels](http://en.wikipedia.org/wiki/Motor_fuel), and [rural (off-grid)](http://en.wikipedia.org/wiki/Stand-alone_power_system) energy services.

There are various definitions of renewable energy. The IEA, for example, defines renewable energy as follows:

“Renewable energy is derived from natural processes that are replenished constantly. In its various forms, it derives directly or indirectly from the sun, or from heat generated deep within the earth.

Included in the definition is energy generated from solar, wind, biomass, geothermal, hydropower and ocean resources, and biofuels and hydrogen derived from renewable resources”.

Renewable energy resources exist over wide geographical areas, in contrast to other energy sources, which are concentrated in a limited number of countries. While many renewable energy projects are large-scale, renewable technologies are also suited to [rural](http://en.wikipedia.org/wiki/Rural) and remote areas. Renewable energy provided an estimated 19% of global final energy consumption in 2012 (REN21, 2014), while total worldwide investments in renewable technologies amounted to more than US$ 214 billion in 2013.

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## 1.2. Why renewable energy

Renewable energy has the potential to play an important role in providing energy with sustainability because of the benefits they provide. The key benefits are:

* + Environmental Benefits: Renewable energy technologies are clean sources of energy that have a much lower environmental impact than conventional energy technologies;
	+ Energy for future generations: Renewable energy will not run out ever. Other sources of energy are finite and will be depleted in the future;
	+ Jobs and the Economy: Most renewable energy investments are spent on materials and workmanship to build and maintain the facilities, rather than on costly energy imports. This means renewable energy investment will create local jobs and boost local economies;
	+ Energy Security: Renewable energy will decrease foreign oil supplies dependence instead of increasing it. This decreased dependency affects energy policy and security.

## 1.3. Types of Renewable energy resources

### 1.3.1. Wind Energy

Wind power or [wind](http://en.wikipedia.org/wiki/Wind) [energy](http://en.wikipedia.org/wiki/Energy) is the energy extracted from wind using wind turbines to produce [electrical power](http://en.wikipedia.org/wiki/Electrical_power), [windmills](http://en.wikipedia.org/wiki/Windmill) for mechanical power or wind pumps for [water pumping](http://en.wikipedia.org/wiki/Water_pumping). Wind power is [renewable](http://en.wikipedia.org/wiki/Renewable_energy), widely distributed and produces no [greenhouse gas](http://en.wikipedia.org/wiki/Greenhouse_gas) emissions during operation. Wind farms consist of several or hundreds of individual wind turbines that are connected to the [electric power transmission](http://en.wikipedia.org/wiki/Electric_power_transmission) network.

  

Onshore wind is competitive and in many places cheaper than coal, gas or fossil fuel plants. Small onshore wind farms can feed some energy into the grid or provide electricity to isolated off-grid locations. Offshore wind is steadier and stronger than on land, and offshore farms have less visual impact, but construction and maintenance costs are considerably higher.

[Wind power](http://en.wikipedia.org/wiki/Wind_power) was growing at over 20% annually, with a worldwide [installed capacity](http://en.wikipedia.org/wiki/Installed_wind_power_capacity) which has expanded rapidly to 336[GW](http://en.wikipedia.org/wiki/Gigawatt) as of June 2014. Wind energy production accounts of around 4% of total worldwide electricity usage.

### 1.3.2. Solar Energy

**Solar energy** technologies use the sun's energy and light to provide heat, light, hot water, electricity, and even cooling, for homes, businesses, and industry. There are varieties of technologies that have been developed to take advantage of solar energy:

* [**Photovoltaic** or solar cells systems](http://www.renewableenergyworld.com/rea/tech/solar-energy/solarpv): Producing electricity directly from sunlight. Solar cells convert sunlight directly into electricity. They are made of semiconducting materials. When sunlight is absorbed by these materials, the solar energy knocks electrons loose from their atoms, allowing the electrons to flow through the material to produce electricity. This process of converting light (photons) to electricity (voltage) is called the photovoltaic (PV) effect.



Solar cells are typically combined into modules; a number of these modules are mounted in PV arrays that can measure up to several meters on a side.

Some solar cells are designed to operate with concentrated sunlight. These cells are built into concentrating collectors that use a lens to focus the sunlight onto the cells.



Solar PV is a [fast-growing](http://en.wikipedia.org/wiki/Growth_of_photovoltaics) technology doubling its worldwide installed capacity every couple of years. At the end of 2013, worldwide PV capacity reached 139 GW.

* [**Solar Thermal Electricity**](http://www.renewableenergyworld.com/rea/tech/solar-energy/solarconcentrating): Using the sun's heat to produce electricity.

Many power plants today use fossil fuels as a heat source to boil water. The steam from the boiling water rotates a large turbine, which activates a generator that produces electricity. The same concept is used for power plants with concentrating solar power systems, where the sun is used as a heat source. There are three main types of concentrating solar power systems: parabolic-trough, dish/engine, and power tower.



The solar thermal power industry is growing rapidly with the global capacity that was up nearly 0.9 GW in 2013 to reach 3.4 GW.

* [**Solar Hot Water**](http://www.renewableenergyworld.com/rea/tech/solar-energy/solarhotwater): Heating water with solar energy.

**Solar thermal** technologies, also known as solar hot water, are typically low to medium cost and are easy to install, operate and maintain. Solar water heating is a well-developed technology that already enjoys reasonably broad deployment. These systems can typically provide all of the hot water needs for residences, hotels, hospitals and apartment buildings.



The main component in a solar water heater is the solar collector. It absorbs solar radiation, converts it into heat, and transfers useful heat to the solar system. There are a number of different design concepts for collectors: besides simple absorbers used for swimming pool heating, systems that are more sophisticated have also been developed for higher temperatures, such as integral storage collector systems, flat-plate collectors, evacuated flat-plate collectors and evacuated-tube collectors.

### 1.3.3. Biomass Energy

**Biomass** is generally defined as any organic feedstock available on a recurring basis. Typical biomass resources include wood and wood waste, landfill gas, agricultural and crop residues, used vegetable oil, human solid waste, and animal manures.

**Biomass energy** or **bio-energy** has been used for thousands of years, ever since people started burning wood to cook food or to keep warm. Today, wood is still the largest biomass energy resource in addition to other biomass resources used to produce fuel for cooking, power or transportation.



There is a also great interest on research involving algae, or algae-derived, biomass due to the fact that it's a non-food resource and can be produced at rates 5 to 10 times those of other types of land-based agriculture, such as corn and soy. Once harvested, it can be fermented to produce biofuels.

### 1.3.4. Geothermal Energy

**Geothermal energy** is the heat from the earth. It's clean and sustainable. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the earth's surface and down even deeper. The uses to which these resources are applied are also influenced by temperature.



The highest temperature resources are generally used only for electric power generation. In other uses, geothermal heat pump systems, consisting of a heat pump and a heat exchanger, can tap into this resource to heat and cool buildings. In the winter, the heat pump removes heat from the heat exchanger and pumps it into the indoor air delivery system. In the summer, the process is reversed, and the heat pump moves heat from the indoor air into the heat exchanger. The heat removed from the indoor air during the summer can also be used to provide a free source of hot water.

The global geothermal generating capacity installed is 12 GW.

### 1.3.5. Marine Energy

The ocean can produce two types of energy: thermal energy from the sun's heat, and mechanical energy from the **tides** and **waves**.



Oceans cover more than 70% of earth's surface, making them the world's largest solar collectors. The sun's heat warms the surface water a lot more than the deep ocean water, and this temperature difference creates thermal energy. **Ocean thermal energy** is used for many applications, including electricity generation.

**Ocean mechanical energy** is quite different from ocean thermal energy. Even though the sun affects all ocean activity, tides are driven primarily by the gravitational pull of the moon, and waves are driven primarily by the winds. As a result, tides and waves are intermittent sources of energy, while ocean thermal energy is fairly constant.

Ocean energy worldwide capacity, mostly tidal power generation, was about 530 MW by the end of 2013.

### 1.3.6. Hydraulic Energy

Flowing water creates energy that can be captured and turned into electricity. This is called **hydroelectric power** or **hydropower**.

The most common type of hydroelectric power plant uses a dam on a river to store water in a reservoir. Water released from the reservoir flows through a turbine, spinning it, which in turn activates a generator to produce electricity. But hydroelectric power doesn't necessarily require a large dam. Some hydroelectric power plants just use a small canal to channel the river water through a turbine.

Another type of hydroelectric power plant - called a pumped storage plant - can even store power. The power is sent from a power grid into the electric generators. The generators then spin the turbines backward, which causes the turbines to pump water from a river or lower reservoir to an upper reservoir, where the power is stored. To use the power, the water is released from the upper reservoir back down into the river or lower reservoir. This spins the turbines forward, activating the generators to produce electricity. A small or micro-hydroelectric power system can produce enough electricity for a home, farm, or village.



 The total global installed capacity is approximately 1,000 GW.

## 1.4. The benefits and the uses of renewable energy worldwide

### 1.4.1 Renewable energy supply

Renewable energy as a source of energy supply continues to be one of the world’s strongest growth industries:

- Approximately 20% of global electricity generation now comes from renewable energy sources.

- Renewable energy accounted for over half of total net additions to electric generating capacity worldwide in 2012.

- Almost 70% of new electric generating capacity in the European Union for 2012 came from renewable.

- Solar photovoltaic electricity generation soared from 10 GW in 2007 to over 139 GW in 2013.

Numerous studies have shown that renewable energy can be rapidly deployed to provide a significant share of future electricity supply. This rapid increase in renewable energy is driven by a number of factors, including falling technology costs, rising fossil-fuel prices, carbon pricing and through government incentives.



### 1.4.2 Renewable energy as an alternative to mitigate pressure on fossil energy

Today, there is a tremendous pressure on fossil fuel to fulfill the increasing demand on energy, and these fossil fuel prices can vary dramatically and are prone to substantial price swings. Renewable energy can replace conventional fuels in four distinct areas: [electricity generation](http://en.wikipedia.org/wiki/Electricity_generation), [hot water](http://en.wikipedia.org/wiki/Solar_hot_water)/[space heating](http://en.wikipedia.org/wiki/Space_heating), [motor fuels](http://en.wikipedia.org/wiki/Motor_fuel), and [rural (off-grid)](http://en.wikipedia.org/wiki/Stand-alone_power_system) energy services. Using these sources of energy can lower the prices of an increasing demand for natural gas, coal and oil by increasing competition and diversifying the energy supplies. An increased reliance on renewable energy can also help protect consumers when fossil fuel prices spike.

### 1.4.3 Impact of renewable sources on the environment and global society

As highlighted in the Rio+20 Outcome Document, the renewable energy sector has a significant role to play in encouraging a transition to a green economy and in addressing the challenge of access to sustainable modern energy services for all.

The adoption of renewable energy technologies can decisively help reduce the carbon emissions of growth (Sims et al. 2007), bearing the potential to save an equivalent of 220–560 gigatonnes of CO2 between 2010 and 2050 (IPCC, 2011).

Generating electricity from renewable energy rather than fossil fuels offers significant public health benefits. The air and water pollution emitted by coal and fossil fuel plants is linked to breathing and health problems.

In contrast, wind, solar, and hydroelectric systems generate electricity with no associated air pollution emissions. While [geothermal](http://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/environmental-impacts-geothermal-energy.html#geothermal_emissions) and [biomass](http://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/environmental-impacts-biomass-for-electricity.html#air) energy systems emit some air pollutants, total air emissions are generally much lower than those of fossil fuel fired power plants.

In addition, wind and solar energy require essentially no or little water to operate and thus do not pollute water resources or strain supply by competing with agriculture, drinking water systems, or other important water needs. In contrast, fossil fuels can have a [significant impact on water resources](http://www.ucsusa.org/clean_energy/our-energy-choices/energy-and-water-use/water-energy-electricity-overview.html). For example, both coal mining and natural gas drilling can pollute sources of drinking water. Natural gas extraction by hydraulic fracturing requires large amounts of water and all thermal power plants, including those powered by coal, gas, and oil withdraw and consume water for cooling.

## 1.5. Limitations to the development of renewable energy

### 1.5.1. Cost limitations

Renewable energy investment, compared to conventional energy, generally requires higher amount of financing for the same capacity. Therefore, renewable energy developers may have difficulty obtaining financing at rates as low as may be available for conventional energy facilities.

In addition to having higher transaction costs, financial institutions are generally unfamiliar with the new technologies and likely to perceive them as risky, so that they may lend money at higher rates. High financing costs are especially significant to the competitive position of renewable energy, since renewables generally require higher initial investments than fossil fuel plants, even though they have lower operating costs.

Reducing subsidies for fossil fuel and nuclear power seems to be difficult politically. Thus, many policies attempt, rather than reducing these subsidies to compensate for the cost related barriers, by providing additional subsidies for renewable energy in the form of tax credits or incentives, by establishing special pricing, power purchasing rules or by lowering transactions costs.

The analysis of data from the survey conducted among the INTOSAI community in response to this question shows that, compared to other constraints, the cost is the most important limitation to the development of renewable energy in the world. Indeed, out of 56 countries that responded to the question, 27 (43.55%) consider the cost as first constraint to this development, 13 countries (23%) consider it as second constraint. Thus, nearly 70% of countries consider the cost of one way or another as the main constraint to the development of renewable energy. The table below shows the importance of cost limitations in 56 countries based on the results of the survey:

**Table n°…: The importance of cost limitations according to the countries responses**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **The importance of the constraint** | **Very important** | **Important** | **Moderately important** | **Weakly important** | **Not important** |
| **Number of countries** | 27 | 13 | 9 | 5 | 2 |
| % | **48,21%** | **23,21%** | **16,07%** | **8,93%** | **3,57%** |

### 1.5.2 Technical constraints

The introduction of new technologies such as renewable energy technologies would require the development of technical skills. The importance of technical know-how and qualified personnel to manage all aspects of the renewable energy development process are essential to ensure their effective use. In addition, there are issues related to the renewable energy resource availability and intermittence. For instance:

- Solar or wind power is dependent on availability of sunlight or wind. Thus, the availability of power fluctuates from zero to maximum every day.

- Total potential of renewable energy source as wind power and tidal power is limited. Plant for generating power from wind, and tides can be located only in places where suitable conditions of tide or wind exist.

- Plant for generating energy from wind and solar energy have to be spread around large areas.

In addition to these constraints, there are other limits related to the integration of these sources of energy into the electrical network. The use of small amounts of intermittent power has little effect on [grid](http://en.wikipedia.org/wiki/Electrical_grid) operations. Using larger amounts of intermittent power may require upgrades or even a redesign of the grid infrastructure.

Technical constraints are the second barrier to development of renewable energy after the cost. According to the results of the survey, among 56 countries that responded to the questionnaire, 27 (48%) consider these constraints as very important factor or significant factor influencing the development of renewable energy. The table below shows the importance of technical constraints in 56 countries based on the results of the survey:

**Table n°…: The importance of** **technical constraints according to the countries responses**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **The importance of the constraint** | **Very important** | **Important** | **Moderately important** | **Weakly important** | **Not important** |
| **Number of countries** | 11 | 16 | 15 | 6 | 8 |
| **%** | **19,64%** | **28,57%** | **26,79%** | **10,71%** | **14,29%** |

### 1.5.3. Institutional constraints

Experience shows that the introduction and success of any renewable energy technology is to a large extent, dependent on the existing institutional framework, local or federal government policies to promote the development and deployment of these technologies.

This institutional framework is an important factor in terms of its ability to create an enabling environment policy, dissemination, sensitization, education, mobilizing resources, as well as encouraging private sector investment.

Institutional constraints represent, according to the results of the survey a moderately significant barrier to development of renewable energy. 32% of countries consider it as important, but, in general, this factor need special attention because the majority of countries (53.6%) consider it important to moderately important. The table below shows the importance of institutional Constraints in 56 countries based on the results of the survey:

**Table n°…: The importance of institutional Constraints according to the countries responses**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **The importance of the constraint** | **Very important** | **Important** | **Moderately important** | **Weakly important** | **Not important** |
| **Number of countries** | 5 | 12 | 18 | 9 | 12 |
| **%** | **8,93%** | **21,43%** | **32,14%** | **16,07%** | **21,43%** |

### 1.5.4. Subsidies for non-renewable

Compared with renewable energy, nuclear and fossil fuel technologies enjoy a considerable advantage in government subsidies. Public subsidies can take many forms such as direct budgetary transfers or tax incentives. They can significantly lower final energy prices, putting renewable energy at a competitive disadvantage if it does not enjoy equally large subsidies.

The fossil fuel subsidies may appear at first glance as a major factor hindering the development of renewable energy. However, the survey results show that only about 11% of countries consider them very important constraint while nearly 61% of countries consider them weakly important to not important. The table below shows the importance of subsidies for non-renewable in 56 countries based on the results of the survey:

**Table n°…: The importance of subsidies for non-renewable according to the countries responses**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **The importance of the constraint** | **Very important** | **Important** | **Moderately important** | **Weakly important** | **Not important** |
| **Number of countries** | 6 | 8 | 8 | 21 | 13 |
| **%** | **10,71%** | **14,29%** | **14,29%** | **37,50%** | **23,21%** |

### 1.5.5. Geographical/natural conditions of specific countries

Some renewable energy sources have geographical restrictions, e.g. land use that reduce the theoretical potential. The geographical potential is the theoretical potential limited by the resources at geographical locations that are suitable. The availability of land in small islands is a real issue and is a typical case for this constraint. In addition, the possibilities of developing renewable energy projects could be limited in some countries or regions because of their resource scarcity or availability.

Geographical conditions may pose a significant barrier to the development of some types of renewable energies, such as solar energy in the countries of northern Europe or hydropower in arid countries, but the diversity of sources of this energy worldwide has meant that this constraint has little effect on the development of renewable energy as a whole. In fact, survey results reveal that only about 9% of countries that responded to this question have this constraint as the main obstacle, while the majority of countries, nearly 79%, see it as weak barrier or totally not a barrier.

The table below shows the importance of Geographical/natural conditions of specific countries in 56 countries based on the results of the survey:

**Table n°…: The importance of Geographical/natural conditions of specific countries according to the countries responses**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **The importance of the constraint** | **Very important** | **Important** | **Moderately important** | **Weakly important** | **Not important** |
| **Number of countries** | 5 | 2 | 5 | 8 | 36 |
| **%** | **8,93%** | **3,57%** | **8,93%** | **14,29%** | **64,29%** |

Some countries mentioned other constraints than those presented in the questionnaire. This is particularly the case for barriers related to low awareness of investors and people about the importance of this sector, and problems related to bank financing and risks of uncertainty that still present this sector.

# Chapter II: Policies and governmental response to renewable energy challenges

## 2.1. Institutional and regulatory aspects

### 2.1.1. National legislation

The regulatory framework laid down by national governments is a key element for creating favorable environment to promote the development, implementation or commercialization of renewable energy and reaching national targets and objectives. To reach the objectives, typical instruments that governments have to lay down rules are: improving the grid access for electricity from renewable energy sources (eg Turkey, Greece, Chile, India, Croatia, UK) designing appropriate incentives (USA, Slovinia) setting the administrative and planning procedures (EU, Morocco, Greece, Norway, Poland, Philipines) , providing information and training on renewable energy equipment, etc. The regulatory framework relates also to the land use, site identification, and finance issues encountered by developers of renewable energy projects. Detailed examples, about countries experiences, are provided **in the appendix I.**

### 2.1.2 Policies and/or programs taken by governments worldwide for promoting and enforcing the renewable energy

The most common policies that have proven their effectiveness recently can be divided into three categories: regulatory, fiscal or public financing incentives or policies. Among these policies are: **Renewable energy targets** which focus on the total energy production of a country, group of countries or region. Targets may specify total primary energy from renewable or minimum renewable energy shares of energy consumption.

Policymakers have turned to renewable energy to achieve a number of goals. The primary objective is generally to maintain or expand energy services. Other social, political, and economic objectives may include reducing health and environmental impacts of fossil fuel energy use, reducing greenhouse gas emissions, enhancing energy access and security as well as improving opportunities for education, job creation, rural economic development, poverty reduction.

In conjunction of designing and putting in place police, the existence of a sector regulator body can be specified in the enabling legislation. The sector regulator body has a number of roles and responsibilities for implementing the legislation. Its role is to provide legitimacy and transparency for regulatory rulings related to renewable energy. The regulator role also is to oversee the system of policy instruments, for example monitoring national incentives instruments to ensure abuses do not arise and evaluate the system effectiveness in meeting renewable energy objectives.

The number of countries with policies to promote the development and deployment of these technologies continues to increase every year. More than 70 governments around the world, and among them all IEA member countries, have put in place targets and policies to support the deployment of renewable energy technologies. **(IEA, 2011, Interactions of Policies for Renewable Energy and Climate)**. This finding was confirmed by the results of the research survey who shows that 100% of the countries, among INTOSAI community, who responded to the survey, have developed policies regarding renewable energy.

The most common policies that have proven their effectiveness recently can be divided into three categories: regulatory, fiscal or public financing incentives or policies. Among these policies are: Renewable energy targets which focus on the total energy production of a country, group of countries or region. Targets may specify total primary energy from renewable or minimum renewable energy shares of energy consumption. The table below shows the main policies taken by governments worldwide, based on the results of the survey:

**Table n°…:** **Key policies, programs or measures adopted in the INTOSAI community countries (based on the results of survey)**

|  |  |
| --- | --- |
|  | **Key policies, programs or measures adopted in the INTOSAI community countries based on the results of survey** |
| **Australia** | **Programs** The focus on renewables in the ACT is currently driven by need to reduce the impact on climate change and to manage end user energy costs.**Main legislation and strategies**- Climate change and Greenhouse Gas Reduction Act 2010 (ACT)- Weathering the change 2007-2025 (ACT)- Carbon Neutral ACT- ACT Sustainable Energy Policy**Principle measures and policies**- Government to be explicit and accountable, i.e promote and drive towards timebound targets (40% reduction of CO2 emissions on 1990 levels by 2020, 100% by 2060)- Leading by example (Gov’t to reduce its own CO2 footprint through greater energy efficiency and the move to cleaner energies) ahead of local community and other jurisdictions in Australia e.g. zero CO2 emissions by 2020 in its operations, via sustainable transport etc- Provide community leadership on energy reform agenda at Territory and National level |
| **Azerbaijan**  | In our Republic , State Program on the use of Alternative Energy sources was adopted in 2004, The State Agency on Alternative and Renewable Energy Sources under the Ministry of Industry and Energy of Azerbaijan Republic was established in 2009, for more rapid development of the use of alternative energy sources The State Company on Alternative and Renewable Energy Sources of Azerbaijan Republic was founded in 2012  |
| **Bahamas** | The Cabinet of the Government of The Bahamas (GOB) appointed the National Energy Policy Committee (NEPC) in 2012 to assess renewable sources of energy, to create public awareness, to develop, implement a national energy policy and to curb greenhouse gases (GHGs) emissions to climate change. |
| **Bangladesh** | (a) Solar system of Bangladesh in off grid area has been established(b) 500 megawatt solar power generation- solar park, solar mini grid has been established(c) Solar irrigation in low lift diesel plant has been established |
| **Bhutan** | 1. Draft Renewable Energy Policy 2012 under process of adoption. The draft policy document, holistically and comprehensively states both the long term as well as the short term objectives. The types of renewable energy technologies to be pursued, and the roles and responsibilities of different institutions and organizations are also specified in the document. The target for the generation capacity of electricity, through the mix of renewable energy resources is set at 20 MW excluding the power generation from the large hydropower sector 2. The Alternate Renewable Energy Policy (AREP) was adopted in April 2013. This provides the long-term direction for the promotion and development of Renewable Energy in Bhutan,3. The Economic Development Policy (EDP) was framed by the Government of Bhutan to create an enabling environment to carry out coordinated economic activities in the country. The policy states the need to create budget mechanisms to fund renewable energy initiatives and to protect the catchment areas.4. Bhutan Sustainable Hydropower Development Policy 2008 was published. As per the policy, the government to meet the growing demand for energy, intends to develop at least 10,000 MW of electricity generation capacity by the year 2020. Apart from mega hydropower development, the policy also acknowledges the need for the development of clean and renewable energy resources. One of the objectives of the policy is to contribute towards the development of clean energy, to mitigate the problems related to global warming and climate change. In order to boost the uptake of renewable energy resource development in Bhutan, the policy specifically states the need to have a “Renewable Energy Development Fund”. The fund shall be used for project development activities including project profiles and reports, site investigation and studies, processing of clearances, acquisition of land, promotion of projects, and facilitation for the accelerated development of hydropower resources”.5. Formulated Integrated Energy Management Master Plan for Bhutan in 2010. |
| **Botswana** | Renewable energy based rural electrification project (pilot), national photovoltaic by rural industries innovation center and other small localized projects were done in Botswana.  |
| **Brazil** | The National Energy Plan foresees that 45% of total energy comsuption in Brazil will come from renewable sources by 2030. Today 80% of electric energy in Brazil already comes from hydropower.  |
| **Cameroon** | An energy development program was put in place, which includes the possibility for private investors and communities to adopt renewable energy initiatives. The government removed monopoly to its Agency in energy matters. |
| **Canada** | In Canada’s federal sustainable development strategy, there is a summary of the key policies and programs. It indicates that the federal government will:“- Invest $1.4 billion over 14 years to support renewable energy projects through the eco-energy for Renewable Power Program;- Develop and implement energy efficiency codes, standards and labeling, information and benchmarking tools through the eco-energy Efficiency Program;- Support clean energy research, development and demonstration projects through the eco-energy Innovation Initiative; and- Encourage businesses, through the accelerated capital cost allowance for clean energy generation equipment, to invest in specified equipment.”  |
| **Chile** | Estrategia nacional de energía 2012-2030. Lineamientos de acción:• Mecanimos de licitación para incentivar el desarrollo• Plataforma Geo referenciada – Potencial Económico para Proyectos de ERNC• Fomento y financiamiento• Nueva Institucionalidad Impulso Decidido a las ERNC• Estrategias por Tecnologías |
| **China** | the 11th and 12th Five-Year Plan of Energy Conservation and Emission Reduction; and the 12th Five-Year Plan of Energy Development, etc. |
| **Costa Rica** | a. National Development Plan 2010-2014: provides critical areas of national attention and possible long-term solutions in order to identify and remove the major obstacles to national development, including environmental and energy issues.b. Electricity Expansion Plan (PEGE) 2010-2021 Generation: programming power generation between 2012 and 2021, to meet growing demand for electricity in the country. It also presents estimates of long-term demand.c. Programming expansion of electricity transmission network between 2012 and 2030, to meet current and new generation of electrical products in the country: Expansion of Electricity Transmission (PETE) 2010-2030 Plan.d. V National Energy Plan 2008-2021: presents an overview about the national energy matrix with its strengths and weaknesses, and the potential for future use and threats to the sustained growth of the sector. |
| **Croatia** | In order to achieve the interests of the development of renewable energy in the Republic of Croatia, the production of electricity from renewable energy sources is covered by the incentive system through preferential purchase prices of generated electricity ("Feed in" tariff system). |
| **Czech Republic** | Directive 28/2009 / EC on the promotion of RES committed CR achieve a 13% share of energy from renewable sources in gross final energy consumption.The main subsidy programs are:- the Operational program Environment (Priority Axis 3 “Grants from the OPE for the Sustainable Use of Energy source”)- the Operational program Enterprise and Innovation (Priority Axis 3 “Efficient energy”)- The program Eco-EnergyThe Rural development program |
| **Denmark** | Binding target:30 % renewable energy in 202010 % renewable energy in 2020 within the transportation sector |
| **ECA** | EU key policies and financial support for renewablesCohesion policy instruments -the European Regional Development Fund (ERDF) and the Cohesion Fund (CF) - are the most important funding source among the EU spending programs for promoting renewable energy. In the 2014-2020 programming period, Cohesion Policy support to the shift towards a low-carbon economy may reach at least EUR 23 billion from the ERDF. Further support can also be provided through the Cohesion Fund. |
| **Estonia** | The National Development Plan of the Energy Sector until 2020 describes the situation in the energy sector of Estonia, its future perspectives on energy markets, required measures and activities for achieving the targets. The overall objective of the plan is to ensure continuous, efficient, sustainable energy supply at a justified price and sustainable energy consumption in Estonia. The new development plan for 2016-2030 is being worked out at present.National Reform Programme ‘Estonia 2020’. |
| **Fiji** | Fiji National Energy Policy (the Policy was revised this year) |
| **Finland** | E.g. Natural Resources Strategy for Finland 2010,The Finnish Bioeconomy Strategy 2014. |
| **India** | 1. The National Tariff Policy 2006 of the government of India requires the State Electricity Regulatory Commissions (SERC) to fix a minimum percentage of Renewable Purchase Obligation from renewable energy sources, taking into account availability of such resources in the region and its impact on retail tariffs and procurement by distribution companies at preferential tariffs determined by the SERCs.2. Jawahar Lal Nehru National Solar Mission from January 2010: launched in 2010, the Mission has set an ambitious target of deploying 20,000 MW of grid connected solar power by 2022, reducing the cost of solar power generation in the country through (i) long term policy; (ii) large scale deployment goals; (iii) aggressive R&D; and (iv) domestic production of critical raw materials, components and products, as a result to achieve grid tariff parity by 2022.3. National Solar Mission of the National Action Plan on Climate Change, 2008 |
| **Indonesia** | In 2013, the Ministry of Energy and Mineral Resources commenced projects by assigning a state owned electricity company as well as private companies to build geothermal, steam and hydroelectric power plants spread over bigger islands. |
| **Ivory Coast**  | “The energy conservation and training in the proper use of energy” program;The project of energy saving in public buildings. |
| **Jordan** | The production of renewable energy currently equivalent to 1%. National energy strategy in Jordan states for 2020 to generate at least 10% of renewable energy sources within the the energy production. |
| **Kuwait** | The Environment Public Authority and the relevant ministries developed some policies  |
| **Lesotho**  | • Rural renewable energy policy under development.• The national budget address on a need for renewable energy.• Consultancy involvement for feasibility study• Establishment of 5 year renewable energy based rural electrification project funded by the government of Lesotho and GEF. The aim was to install 5000 solar Home systems in the 3 mountainous districts by the end of 2012.• The current project aims at providing 10 villages which were affected by Metolong Dam Construction with stand alone solar PVC systems• Future plan to develop hybrid plant that would generate 6000 megawatts of wind power and 4000 megawatts of hydropower. |
| **Lithuania**  | The Law on Energy from Renewable Sources established a common system of promoting the use of energy from renewable sources in the Republic of Lithuania.The main tasks in the individual energy sectors in 2020 are as follows:1) to increase the share of energy from renewable sources in all modes of transport at least up to 10 per cent as compared with the final energy consumption in the transport sector;2) to increase the share of electricity generated from renewable sources not less than up to 20 per cent as compared with the country’s gross final consumption of energy;3) to increase the share of district heat produced from renewal energy sources in the heat balance at least up to 60 per cent, and to increase the share of renewable energy sources in households in the balance of energy sources used for heating at least up to 80 per cent. |
| **Malaysia** | National Green Technology PolicyNational Water Resource Policy |
| **Maldives** | The government commissioned an expert to draft an environment and social management framework for the proposed solar PV projects under accelerating sustainable private investment program. In 2010, the then Ministry of Housing and Energy adopted the Maldives National Energy Policy and Strategy, which seeks to provide incentives for renewable energy technologies, energy efficiency and energy conservation. The government elected in 2008 set a target of 2020 for the Maldives to achieve carbon-neutrality. In 2013, the government set a target of ensuring 50 per cent of power generation by renewable sources in 2025. The Maldives is one of the six pilot countries participating in the Scaling up Renewable Energy Program (SREP) funded by donor agencies. |
| **Malta** | National Energy Efficiency Action Plan (2011)National Renewable Energy Action Plan (NREAP) (2011) |
| **Morocco** | Morocco has set an ambitious plan to develop renewable energy, with a 2020 target, of 2000 MW installed for each of solar, wind and hydro technologies. On energy efficiency side, Morocco has a target of 12% energy savings by 2020. The specific objectives are to (1) Reduce energy consumption in buildings, industry and transport by 12% by 2020 and 15% by 2030 (2) Increase the installed renewable energy capacity to 42% of total electricity capacity by 2020 (14% solar, 14% wind and 14% hydro).- Wind energy: There is an ongoing national wind program, with an estimated cost of USD 3.5 billion, that aims at the development of wind farms with an installed capacity of 2 GW by 2020. The program will avoid 5.6 million tCO2 per year.- Solar energy: The on-going Moroccan Solar Program, with an estimated cost of USD 9 billion, aims at the installation of 2 GW at five selected sites, with the first plant in Ouarzazate site will be operation on 2015. The global project will be commissioned by the end of 2019. |
| **Moldova** | \*Energy Strategy of the Republic of Moldova until 2020 This Strategy covers the objectives, measures and activities aimed at achieving a more efficient energy complex, competitive and secure, ensuring also the country's energy security, modernization of existing energy infrastructure, improving energy efficiency, renewable energy use and integration into the European energy market;\*National Energy Efficiency Program for 2011-2020 |
| **Netherlands** | (overlaps with incentive mechanisms)Since 2003: subventions for renewable energy.Since sept. 2013: agreement between a large number of stakeholders to carry out measures to get rapidly much more renewable energy (14% in 2020, in conformity with EU target for NL, 16% in 2023) |
| **New Zealand** | The key policy is New Zealand has a target of 90% of electricity generation coming from renewable sources by 2025, providing this does not affect security of supply. NZ is on track to meet this target, thanks to abundant renewable energy resources. |
| **Norway** | An action plan for renewable energy was submitted in 2012 by the Norwegian Water resources and Energy Directorate and lays out how Norway wants to achieve an overall renewable share of 67.5 % and a renewable share in the transport sector of 10 % by 2020. The common Norwegian-Swedish market for electricity certificates in 2012 has a combined goal of establishing 26.4 TWh new electricity production based on renewable energy in 2020. Norway and Sweden are each responsible for financing 13.2 TWh in the certificate system, regardless of the amount of production that is located in each of the two countries. |
| **Philippines**  | • National Biofuels Program (2010-2030)• National Renewable Energy Program (2010-2030) |
| **Poland** | 1. State Environmental Policy for the years 2009-2012 including the perspective until the year 2016 (M.P. of 2009 No. 34, item 501);2. Poland’s Climate Policy - Strategy to reduce greenhouse gases in Poland until the year 2020 (approved by the Council of Ministers on 4 November 2003); 3. State Energy Policy until the year 2030 (M.P. of 2010, No. 2, item 11) and sector programs; 4. Scenarios (“with activities” and “without activities”) of the greenhouse gases emission for the years 2005, 2010, 2015 and 2020 (document prepared at the request of the Minister of Environment by the National Emission Centre, adopted in 2006); 5. Poland 2025 – Long-term strategy of a permanent and sustainable development (adopted by the Council of Ministers on 26 July 2000); 6. Strategy of the renewable energy development (prepared by the Ministry of Environment in September 2006); 7. Specification of the activities aimed at the improvement of energetic efficiency (M.P. of 2013, item 13);8. Multiannual promotional program of biofuels and other renewable fuels for the years 2008–2014 (M.P. of 2007 No 53, item 607);9. Second National Work Plan concerning the energetic effectiveness of Poland 2011 (adopted by the Council of Ministers on 17 April 2012); 10. Notice of the Minister of Economy of 24 May 2011 on the report setting up goals in the scope of the share of electricity produced in the renewable energy resources located in Poland, in the national use of electricity for the years 2010-2019 (M.P. of 2011 No. 43, item 468). |
| **Saudi Arabia** | • The King Abdullah City for Atomic and Renewable Energy (K●A●CARE) has announced the implementation of a national project aimed at measuring and mapping renewable energy resources in the Kingdom• (K●A●CARE) is planning to Develop and issue performance and reliability standards for Saudi conditions for PV and CPV solar technologies by 2013 and for CSP solar technologies by 2014 |
| **Slovenia** | Annual plans of subsidies to private and institutional investors for exploiting solar, wind, biomass and geo-power to produce electricity  |
| **Spain** | Renewable Energy Enhancement Plan 2000-2010 |
| **Tanzania** | NATIONAL ENERGY POLICY REVIEW OF 2014 TO INCORPORATE SEVERAL RENEWABLE ENERGY POLICIES |
| **Thailand** | The Renewable and Alternative Energy Development Plan (AEDP 2012-2021) |
| **Turkey** | Government outlined ambitious overall targets in the May 2009 Electricity Market and Security of Supply Strategy for renewable electricity generation i.e. at least 30% of total electricity will be met by renewables in 2023. According to these targets, hydropower potential should quadruple its 2009 achievements; wind power capacity should increase to 20 GW which was 2,312 GW in 2010 in company with increases in solar and geothermal energy use. In order to obtain these results, large investments in grids and generating capacity are also needed together with revised and increased policy support. |
| **United Kingdom**  | Electricity Market Reform program |
| **USA** | The Environmental Protection Agency administers a legislatively mandated requirement that sellers of petroleum products use ever-increasing volumes of biofuels blended into gasoline and diesel fuel.The Department of Energy’s (DOE) Loan Program Office has provided low interest loans to numerous renewable energy projects (for more information, see: http://www.gao.gov/products/GAO-14-367). The Department of Agriculture also provides grants and loan guarantees for renewable energy projects. |
| **Yemen** | Conduct feasibility studies, especially the introduction of renewable energy sources including taking into account the potential effects on biodiversity;From policy priority for the government to prepare a national strategy for renewable energy. |
| **Zimbabwe** | Petroleum (Mandatory Blending of Anhydrous Ethanol with Unleaded Petrol) Regulations 2013. |

### 2.1.3 Support to R&D and reduction of production costs

Technology is key to both increasing access to energy supplies and the public support for R&D which is essential for reducing the private costs of innovation, whose benefits are shared broadly by society. The role of direct government support can be large in the early stages of innovation and become smaller as technologies mature. In R&D, the general role of the public sector is in supporting high-risk, fundamental research with a long-term perspective, while the private sector tends to focus on near-competitive technologies and shorter-term demonstration projects.

The public sector can support research institutes and academic institutions, fund research programs targeted at specific technologies and supply grants to private-sector R&D efforts.

In developing countries, the focus should be on creating capacity to facilitate technology transfer, adapt technologies to local market conditions and support private-sector players that install, manufacture, operate and maintain the technologies.

In many developing countries, the national renewable energy sector faces many barriers to development, due partly to a lack of expertise and limited access to appropriate technologies and knowledge. Especially least developed countries (LDCs) are severely challenged with respect to the science, technology and innovation of renewable energy. LDCs also face the challenge of having to bridge the digital divide and technology gap in support of sustainable development and poverty eradication (UN 2012c).

Through the responses to the survey conducted among the INTOSAI community, it appears that government policies on R&D focus in particular on issues of funding and implementation of research facility and coordination of the research. The issue of cost reduction remains the main objective of most research programs.

The table below shows examples of governments interventions to promote R&D in renewable energy sector:

**Table n°…: Support to R&D and reduction of production costs (based on the RE survey)**

|  |  |
| --- | --- |
|  | **Support to R&D and reduction of production costs (based on the RE survey)** |
| **Australia** | Indirectly investing in R&D by supporting, enhancing and leveraging R&D partnerships.Promoting clean economy, through leadership in economic development (Clean technology business strategy 2011-2015). |
| **Bahamas** | The GOB has promoted policies and programs in the areas of energy efficiency to reduce the cost of electricity to consumers and those doing business in the Bahamas. Specific initatives include: introduction of renewable energy (RE), review of waste to energy (WTE) options, introduction of alternative sources of fuel and private sector participation for the production of electricity. |
| **Bangladesh** | (a) Independent energy institute has been established in Dhaka University(b) Independent Directorate has been set up in Bangladesh Power Development & Rural Electrification Board. |
| **Brazil** | Eletric utilities must invest at least 1% of their net operating income in R&D and energy efficiency. |
| **Canada** | Several programs have been used by the Canadian federal government to support research and development and to reduce production costs (see the websites listed below and the OAG study described below for more details). They include programs and funding by Natural Resources Canada and Sustainable Development Technology Canada (http://www.sdtc.ca/index.php?page=home). |
| **Chile** | Strategies for renewable energy strategies (ERNC): collaboration of public & private sector, researchers and representatives of citizens in order to develop measures to address the obstacles of each of these technologies, specifically contemplating aspects such as research, development and innovation Sector (I + D + i), resource exploration, development instruments and financial and regulatory framework. |
| **China** | Increased capital input for research and development, reduced cost of production for demonstration and industrialized development.  |
| **Czech Republic** | Tax exemptions for investors in producing energy from renewable sources. |
| **Denmark** | Approx. 1 Billion DKK – 135 Million pr. Year to R&D within the Energy sector.  |
| **ECA** | EU Financial support: The 6th and the 7th Framework Programs, which are the EU’s main instrument for funding research in Europe have earmarked 3.15 billion euro over the period 2000-13. The bulk of the funds has been devoted to renewable energy sources and to the development of clean fossil fuels / CCS technologies. |
| **Estonia** | The hindrance to the development of the renewable energy sector is the fact that the oil shale energy is currently supported by the state more than the renewable energy sector. The subsidies for renewable energy depend on the technology (e.g different conditions for combustion of biomass and production of wind energy). Wind energy production is limited by the annual amount of electricity produced from wind, as the state pays subsidy annually totally for 600 GWh of wind energy production. If this goal is reached by the producers the subsidy is not paid anymore. This makes the wind energy producers unsecure to make new investments.  |
| **Finland** | Financial bodies: The Finnish Funding Agency for Innovation, the Ministry of Employment and the Economy, Ministry of Agriculture and Forestry, Ministry of the Environment. |
| **India** | 1. Program on “Research, Design and Development of Solar Photovoltaic Technology (SPV) and Solar Thermal Technology (ST)” during the current financial year 2014-15 implemented from July 20142. Policy Guidelines of Research, Design, Development, and Demonstration implemented from October 20103. National Solar Mission of the National Action Plan on Climate Change |
| **Indonesia** | Revolving funds provided by The Government investment center and the Ministry of Finance to supportgeothermal exploration. |
| **Korea** | New energy R&D (Wind, Solar, Hydrogen Energy): Supported by Ministry of Trade, Industry and Energy;Renewable Energy (Biogas, RDF) R&D : Supported by Ministry of Environment. |
| **Morocco** | To reinforce R&D activities at the national level, an institute called IRESEN was created in order to enable a favorable environment for the deployment of these activities. |
| **New Zealand** | New Zealand hydro and geothermal developments are amongst the country’s greatest engineering achievements. NZ has well regarded expertise in geothermal and developing expertise in wind energy. |
| **Norway** | Energy21 was established by the Ministry of Petroleum and Energy in 2008 and is the national strategy for research, development and commercialization of new climate-friendly energy technology.ENERGIX is the name of the Research Council of Norway’s successor to the R&D programme RENERGI – Clean Energy for the Future. The program was launched in 2013 and will run for ten years.In 2009, eight Norwegian research groups were declared Centres for Environmentally-friendly Energy Research (FME). |
| **Philippines**  | • Based on the NREP, development of demonstration projects such as sea water pumped storage shall be conceptualized. A demo project on concentrating solar thermal power technology shall also be pursued. R&D activities will also be undertaken in cooperation with R&D institutions and technical centers, both local and foreign, as well as interested multilateral organizations, NGOs or private sector partners.• Reduction of production cost is inherent to the provision of fiscal and non-fiscal incentives under RA 9513. |
| **Poland** | Financial support (out of the EU funds and national environmental protection funds) of enterprises aimed at the increase of the share of energy produced in the country, including the granting of preferable credits aimed at the limiting of greenhouse gases emission and the increase of the renewable energy production. This support concerns in particular the development of high performance cogeneration, technologic changes aimed at the decrease of energy demand, construction of new renewable energy resources, development of technology and construction of installation to gain renewable energy, develop scientific research and development works to implement the energy policy.  |
| **Uganda** | International and local trainingsEstablishment of Uganda National Council of Science and Technology (UNCST), Uganda Industrial Research Institute (UIRI), Centre for Research in Energy and Energy Conservation (CREEC)SET up of demo systems in Renewable Energy TechnologiesData collection and analysis |
| **United Kingdom**  | Overall program for R&D coordinated by Low Carbon Innovation Co-Ordination Group. Various R&D schemes funded by government: Environmental and Physical Sciences Research Council (EPSRC)Department of Energy and Climate Change Innovation ProgramTechnology Strategy BoardScottish EnterpriseGovernment works with industry to identify how to reduce production costs through the Offshore Wind Cost Reduction Task Force |
| **USA** | Department of Energy has an office of energy efficiency and renewable energy to foster research and development (R&D) on a broad range of renewable energy areas. DOE’s office of Science also does basic science research that supports renewable technologies, including material science and bio-science.  |

## 2.2. Incentive mechanisms and market based instruments

Governments can improve the risk-return profile of renewable energy by assuming some of the financial risk. A wide suite of public incentive mechanisms such as national targets and feed-in tariffs are available. Each type of incentive mechanism has advantages and disadvantages. Hence, the choice of the incentive mechanism to be used will depend on the local circumstances of the country, the energy sector concerned, and the nature and ambition of the corresponding national renewable energy targets (UNEP, 2012c).

### 2.2.1 The purchase rate

**Feed-in tariff**: This scheme provides support for energy from wind power, solar power, hydro power, biomass and geothermal sources, among other technologies. This scheme is a key renewable energy support mechanism. The system is generally financed through the public contribution to the electricity service which is an amount added to the electricity bill of each electricity consumer. This mechanism provides security for investors by guaranteeing revenues with a long-term perspective to production capacity for renewable energy. The eligible [renewable electricity](http://en.wikipedia.org/wiki/Renewable_electricity) generators, including homeowners, business owners, farmers and private investors, are paid a cost-based price for the renewable electricity they supply to the grid.

Under this scheme, a price is set, that is generally guaranteed over a certain period of time, at which power producers can sell renewable energy generated electricity into the grid. Feed-in tariffs are expressed in national currency per kWh or MWh.

### 2.2.2 Green certificates:

This is a tool for trading and meeting renewable energy obligations among consumers and/or producers, and also a means for voluntary green power purchases. A [Renewable Energy Certificate](http://en.wikipedia.org/wiki/Renewable_Energy_Certificates), also known as Green Certificate, is a tradable commodity proving that certain electricity is generated using renewable energy sources. Typically one certificate represents generation of 1 MWh of electricity.

Green certificate markets allow producers or purchasers of renewable energy who earn green certificates to sell those certificates to those who need to meet obligations but have not generated or purchased the renewable power themselves. Those without obligations but who wish to voluntarily support green power may also purchase certificates. Several countries use green certificates as a mean to make the support of green electricity generation closer to a market economy instead of investment support as the feed-in tariffs. Such national trading schemes are in use in e.g. Poland, Sweden, the UK, Italy, Belgium and some US states.

### 2.2.3 Electric utility quota obligation/renewable portfolio standard (RPS):

The RPS mechanism generally places an obligation on [electricity supply](http://en.wikipedia.org/wiki/Electricity_supply) companies to produce a specified fraction of their electricity from renewable energy sources. Certified renewable energy generators earn certificates for every [unit](http://en.wikipedia.org/wiki/Units_of_measurement) of electricity they produce and can sell these along with their electricity to supply companies. Supply companies then pass the certificates to a regulatory body to demonstrate their compliance with their regulatory obligations. Because it is a [market](http://en.wikipedia.org/wiki/Market_%28economics%29) mandate, the RPS relies almost entirely on the private market for its implementation. Unlike [feed-in tariffs](http://en.wikipedia.org/wiki/Feed-in_tariffs) which guarantee purchase of all renewable energy regardless of cost, RPS programs tend to allow more price competition between different types of renewable energy, but can be limited in competition through eligibility for RPS programs.

**- Net metering**:It allows a two-way flow of electricity between the electricity distribution grid and the customer with its own generation. The customer pays only for the net electricity used.

### 2.2.4 Tax incentives

Taxes can be an alternative to subsidies or used in combination with them in order to shape the structure of incentives facing producers and consumers in energy markets. A tax is one of the most efficient measures for raising the externalities of carbon emissions in energy production and use.

Governments now offer a wide variety of fiscal incentives and related programs to support renewable energy investment, including:

*-*Investment and production tax credits:These policies provide incentives in the form of lower investment costs via a tax relief or to offset costs through a stream of payments based on power production via production tax credits.

*-*Reductions in sales taxes, energy taxes, property tax, CO2 taxes, VAT and other taxes: These policies concern reduction in taxes which is applicable to the purchase or production of renewable energy technologies

### 2.2.5 The list of state subsidies for renewable energy resources

Apart from feed-in tariffs – which are basically financed by cross subsidies among users – direct subsidies for renewable energy can also provide assistance in the early stages of market diffusion. Subsidies can be in the form of investment support, grants or rebates to reduce capital costs, cover a percentage of the capital cost of an investment or in the form of operating support.

Subsidies, however, need to be judiciously designed and applied for a variety of reasons. Subsidies will most likely need to be adjusted over time in order to be efficient, and such changes are likely to be opposed by businesses or consumers who benefit from them. Such support also needs to take into account requirements of international agreements, in particular the rules and regulations of the WTO.

Besides subsidies, there are other forms of **public financing** of renewable energy such as:

**Public investment, loans and grants**:Public investments and market facilitation activities, which offer a wide range of public policies that reduce market barriers and facilitate or accelerate renewable energy markets. This includes policies such as:

- public benefits funds to pay the difference between the cost of renewable and conventional generating facilities, providing renewable energy services, funding public education on renewable energy related issues and supporting research and development.

- Infrastructure policies include policies for design standards, equipment standards, training and licensing.

**Public competitive bidding/tendering**:Under the tendering system, contracts to construct and operate specific projects or specific quantities of renewable capacity are awarded. Bidding for renewable power capacity can be done at the national or sub-national levels.  By encouraging competition between utilities, the goal of the tendering system is to reduce the price of supplying renewable energy.

The table below shows examples of incentive mechanisms and market based instruments implemented by some countries to promote the development of renewable energy sector (according to the survey results):

**Table n°…. : Incentive mechanisms and market based instruments (based on RE survey)**

|  |  |
| --- | --- |
| **Countries** | **Incentive mechanisms and market based instruments (based on RE survey)** |
| **Australia** | Influencing the market in order to encourage uptake of renewable energy (‘Greenpower’) and other clean energy products.Faciliate market (i.e. Government purchase) for carbon offsets from non-renewable energy users or producers.Support via subsidy (feed-in tariff) or grant the development of medium and large-scale renewable energy generation within the Territory. |
| **Bahamas** | • Reduce and/or exempt duty for the importation of energy efficient equipment and solar panels• Launch public education campaign on energy conservation, changing customer behavior• Promote energy efficient applicances and improve energy management in public buildings• Installation of solar water heaters and photovoltaic systems in homes and replaced florescent bulbs with incandescent light bulbs. This initiative was a pilot project sponsored by the International Development Bank ( IDB). |
| **Brazil** | Wind and biomass energy prices are subsidized in order to be competitive with other sources. This subsidy should span 20 years.  |
| **Canada** | Several incentive programs and market-based instruments have been used by the Canadian federal government (see the website below for more details). Two examples of the programs include: (1) Green Infrastructure Fund - Through Canada's Economic Action Plan, the Government of Canada established the Green Infrastructure Fund (2009-2014). This program specifically targets projects that will improve the quality of the environment and lead to a more sustainable economy over the long term.Through the Green Infrastructure Fund, Infrastructure Canada supports projects that promote cleaner air, reduced greenhouse gas emissions and cleaner water. This includes new or rehabilitation infrastructure projects that fall into the following categories:•Wastewater infrastructure•Green energy generation and transmission•Solid waste•Carbon transmission and storage(2) EcoEnergy for Biofuels - The Government of Canada is committed to expanding the production and use of cleaner renewable biofuels such as ethanol and biodiesel. The Government has a four-pronged biofuels strategy in order to:•reduce the greenhouse gas (GHG) emissions resulting from fuel use,•encourage greater production of biofuels,•accelerate the commercialization of new biofuel technologies, and•provide new market opportunities for agricultural producers and rural communities.On July 5, 2007, Prime Minister Stephen Harper announced one key aspect of this strategy, the ecoENERGY for Biofuels Initiative, which will invest up to $1.5 billion over 9 years to boost Canada's production of biofuels. |
| **China** | industrial development directory of renewable energy, price tools, tax tools, capital support, etc. |
| **Costa Rica** | Selective exemption from excise, ad valorem tax and 1% of the customs value (equipment and materials in photovoltaic panels, wind and hydro generators AC). Law No. 7447, Regulation Law Rational Use of Energy, December 13, 1994, Article 38.Forestal Law No. 7575, February 13th, 1996; Biodiversity Law No. 7788, april 30, 1998. Cap and Trade Mechanism (Payment for Environmental Services Program). 3,5% tax on hydrocarbons. |
| **Croatia** | Croatian energy market operator performs activities in system for incentivizing electricity production from renewable sources and cogeneration and in system for incentivizing production of biofuels. Main responsibilities in systems of incentives include: • concluding contracts with incentivized eligible producers,• concluding contracts with all suppliers regarding regulated purchasing of minimal share of electricity produced from renewables and cogeneration,• collecting incentive fee from all suppliers on electricity market,• financial settlement according to concluded contracts,• collecting of incentive fee for production of biofuels for transport from distributors who put diesel fuel or gasoline on the market,• distribution of incentive fee to producers of biofuels. |
| **Cyprus** | Based on the provisions of Law no. 33(I)/2003, a special Fund for promoting energy conservation and the utilization of renewable energy sources was established. The proceeds of the Fund, which are generated from the imposition of a special levy on kWh consumed on each electricity bill, are used to finance subsidy programmes for the promotion of RES and energy conservation. In the period 2004 (when the fund became operational)-August 2009 (the date of our last audit - see summary below), more than 43,500 applications were submitted for the schemes financed by the fund, and a total of €39.85 million were granted to beneficiaries. |
| **Denmark** | The EU-tradeable permit system on CO2CO2-tax, Electricity-tax (tax exemption on certain renewable electricity)Feed in tariffs for renewable energySee also: http://www2.oecd.org/ecoinst/queries/# |
| **Estonia** | 1. In order to promote the use of renewable energy sources, the subsidies in the Electricity Market Act are introduced. The subsidies are paid by the electricity consumers (electricity excise). 2. From January 1st, 2013, Estonia joined the Nordic-Baltic electricity market, which gives the advantages to the renewable electricity compared with electricity produced from fossil fuels. The first ones able to sell to the electricity market are the companies producing energy from renewable energy sources. 3. The increase of the price of electricity produced from fossil fuels (oil-shale) gives better opportunity for development the renewable energy sector. 4. The interconnection between Estonia and Finland - EstLink 2 was commissioned in February 2014. This has considerably increased the Cross-Border Electricity Flow in the Baltic Sea Region.  |
| **India** | 1. Scheme for Generation Based Incentive for Grid Interactive Power Projects: Government of India project 2. Scheme of Accelerated Depreciation for Investments in power plants based on renewable energy sources 3. Scheme for providing financial subsidy for installation of solar photovoltaic lights and water pumping systems |
| **Indonesia** | Fiscal incentives provided for green building projects including investment allowance, tax holiday and exemption of import duties.  |
| **Lithuania** |  The use of renewable energy sources is promoted by applying the specified support scheme consisting of one or several support measures. The following are considered as support measures:1) fixed rate;2) purchase of energy from renewable sources;3) reimbursement of the costs of connection of renewable energy installations to energy grids or systems;4) reservation of the capacity and transfer capability or other relevant technical parameters of energy grids or systems for connection of renewable energy installations;5) priority of transmission of energy from renewable sources;6) release of electricity generators from responsibility for balancing of generated electricity and/or reservation of electricity generation capacities during the promotion period;7) support for production and processing of agricultural commodities, namely, raw materials for the production of biofuels, biofuels for transport, bio lubricants and bio oils;8) the requirements in relation to mandatory use of renewable energy sources for energy production and/or mandatory consumption of energy from renewable sources, also the requirements for the use of biofuels for transport;9) Support of investments in renewable energy technologies. |
| **Malaysia** | Feed-in-Tarrif (FiT) subsidy to consumers using electricity from renewable resources |
| **Malta** | Grants for installation of PVs (domestic and industrial), grants for solar water heaters, grants for wind turbines (domestic), grants when purchasing electric carsIntroduction of Feed-in Tariffs. |
| **Morocco** | * An Energy Development Fund (FDE) was created in order to: - strengthen and preserve the production capacity from local energy sources including renewable

- provide financial support for efficiency energy projects  - provide support to energy services companies * An Energy Investment Company (SIE) was created to:

- support the national development of renewable energy - invest in energy production projects - valorization of renewable energy resources - reinforcement of energy efficiency.* Total abolition of subsidies to fossil fuels.
 |
| **Netherlands** | Most important now: subvention on production of renewable energy, changing with the energy prices, different for various techniques. Predecessors have existed since 2003. |
| **New Zealand** | The New Zealand Emissions Trading Scheme encourages renewables in preference to fossil fuels by introducing a price on carbon. |
| **Norway** | Enova SF was established in 2001 in order to to promote environment friendly conversion of energy consumption and generation, as well as development of energy and climate technology. Enova is a state-owned enterprise that manages the assets in the Energy Fund. Transnova SF was established in 2009 in order to encourage sustainable mobility solutions by providing grants for pilot and demonstration projects.Disincentives for fossil energy: Fuel oil, kerosene and natural gas are subject to a carbon tax. The European CO2 Emissions Trading Scheme (ETS) whichNorway is a part of influences power prices in Norway. |
| **Philippines**  | • Under the RA 9513, its objectives are to accelerate the development of the country’s renewable energy resources by providing fiscal and non-fiscal incentives to private sector investors and equipment of manufacturers/suppliers.• Fiscal Incentives: (Lowering of Investment Costs)o Income Tax Holiday and Low Income Tax Rateo Reduced Government Shareo Duty-free Importation of Equipment and VAT-zero Ratingo Tax Credit on Domestic Capital Equipmento Special Realty Tax Rate on Equipment and Machineryo Cash Incentive for Missionary Electrificationo Exemption from Universal Chargeo Payment of Transmission Chargeso Tax Exemption on Carbon Credits• Non-fiscal Incentives: (Enhanced Competitiveness)o Mandatory Utilization of RE Resources§ Biofuels Mandate§ Renewable Portfolio Standard (RPS)§ Feed-In Tariff (FIT)o Provision of Interconnection / Ancillary Serviceso Other Market Options Net Metering Concept Green Energy Option |
| **Poland** | Information campaign conducted to the benefit of a rational use of energy, promotion of sustainable agriculture and forestry, issuing of energy resource certificates, development of the competition mechanisms as the main means to rationalise energy prices, introduction of market methods to shape the heat prices, obligation to buy energy produced in the renewable energy resources by companies conducting activity in the scope of production and trading of electricity and the exemption from the excise of the energy out of the renewable energy resources, reversing the excise or imposing fines for the introduction into trade of fuels and biofuels of features non-compliant with legal regulations. |
| **Slovenia** | Better, fixed prices for producers of electricity from renewable sources;Fees on consumption of energy produced by fossil fuels. |
| **Turkey** | Renewable Energy Law currently presents the following incentives for renewable energy technologies:• Wholesale price support (feed-in tariff system) with additional prices for technologies which are 100% domestic product;• Exemptions from license fees and power transaction duties;• Priority to grid access;• Compulsory purchase for retail license holders (The amount that a retail license holder has to buy cannot be less than the market share that he acquired previous year);• Support for land use (Forest lands or the properties of Treasury can be extended or leased out for renewable energy generators).Also the Environment Law with Law No. 2872 was amended by Law No. 5491 on 6.04.2006 and using incentives such as obligatory standard taxes, excise tax exemptions, carbon trading, and emission fees is legitimatized. |
| **Uganda** | Establishment of Uganda Energy Credit Capitalisation Company-low credit to facilitate supply of renewable energy technologiesEnd user subsidy for solar Photovoltaic (PV) systems (PVTMA) AND Solar Water HeatersPublic Private Partnerships (PPP) projects |
| **United Kingdom**  | IncentivesLarge scale renewable electricity generatorsRenewables Obligation (pre EMR)Feed in Tariffs with Contracts for Difference for renewable generators (post EMR)Small scale renewable electricity generatorsFeed-in-Tariffs for small scale renewables (pre and post EMR)Renewable Heat IncentiveRenewable Transport Fuel ObligationPlus tax and EU Emissions Trading Scheme disincentivising non-renewables |

# Chapter III: Role of international cooperation in the development of renewable energy

## 3.1. Legislation aspects and mobilization of funding

Energy issues are gaining increasing importance at international level. The CSD and UNFCCC platforms are focusing on energy, climate change. Negotiations are underway for a post-Kyoto (2012) international climate change regime. The G8 meetings seem to have a continuous focus on energy focusing more and more on renewable energy development issues. The international community has recognized the critical role that renewable energy can play in meeting its objectives of poverty alleviation and climate change mitigation.

Technology transfer is one good example of international cooperation in the development of renewable energy. It is the flow of knowledge, experience and equipment from one area to another, from an industrialized country to a developing country, but it can also be between developing countries or even from urban areas to rural areas. Like other new technologies, renewable energy faces barriers that relate to technology transfer. Before a technology can be transferred successfully, enabling conditions need to be fulfilled, such as institutional and adaptive capacity, access to finance, and knowledge of the technology.

Also, in terms of international cooperation, supporting renewable energy programs are at the forefront in terms of official development assistance (ODA). The majority of donor countries have either highlighted energy, access to sustainable energy or renewable energy development programs as one of their ODA priorities. Several initiatives were launched for Poverty Eradication and Sustainable Development.

## 3.2. The international climate policy (the importance of international cooperation in using renewable energy sources and developing technologies)

- **The United Nations Framework Convention on Climate Change (UNFCCC**) is an international environmental [treaty](http://en.wikipedia.org/wiki/Treaty). The objective of the treaty is to "stabilize [greenhouse gas](http://en.wikipedia.org/wiki/Greenhouse_gas) concentrations in the atmosphere at a level that would prevent dangerous [anthropogenic](http://en.wikipedia.org/wiki/Human_impact_on_the_environment) interference with the climate system". The treaty itself set no binding limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. In that sense, the treaty is considered legally non-binding. Instead, the treaty provides a framework for negotiating specific international treaties (called "protocols") that may set binding limits on greenhouse gases.

The UNFCCC entered into force on 21 March 1994. As of March 2014, UNFCCC has 196 parties.

The parties to the convention have met annually from 1995 in Conferences of the Parties (COP) to assess progress in dealing with [climate change](http://en.wikipedia.org/wiki/Climate_change).

One of the first tasks set by the UNFCCC was for signatory nations to establish [national greenhouse gas inventories](http://en.wikipedia.org/wiki/Greenhouse_gas_inventory) of [greenhouse gas](http://en.wikipedia.org/wiki/Greenhouse_gas) (GHG) emissions and removals.

- **The Kyoto Protocol**is an international treaty, adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. There are currently 192 Parties to the Protocol. The Kyoto Protocol implemented the objective of the UNFCCC to fight global warming by reducing greenhouse gas concentrations in the atmosphere to a level that would prevent dangerous anthropogenic interference with the climate system. The Protocol puts the obligation to reduce current emissions on developed countries on the basis that they are historically responsible for the current levels of greenhouse gases in the atmosphere. As a result, it sets binding emission reduction targets for 37 industrialized countries, mostly member states of the European Economic Area in its first commitment period. These targets add up to an average five per cent emissions reduction compared to 1990 levels over the five-year period 2008 to 2012.

The Protocol’s first commitment period started in 2008 and ended in 2012. A second commitment period was proposed in 2012, known as the Doha Amendment, which would commit only Europe to further CO2 reductions until 2020 but has yet to be ratified. Negotiations are currently under way to agree on a post-Kyoto legal framework that would obligate all major polluters to pay for CO2 emissions. The new framework will be negotiated at the December 2015 meeting of the Conference of Parties to the UNFCCC in Paris, France.

**- Commission on Sustainable Development (CSD)**: The United Nations Commission on Sustainable Development (CSD) was established by the UN General Assembly in December 1992 to ensure effective follow-up of United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit. From its inception, the CSD was highly participatory in structure and outlook, by engaging in its formal proceedings a wide range of official stakeholders and partners through innovative formulas.

Since its establishment in 1992, the Commission has greatly advanced the sustainable development agenda within the international community.

## 3.3. Clean Development Mechanism (CDM)

The Clean Development Mechanism (CDM), defined in Article 12 of the Kyoto Protocol, allows a country with an emission reduction commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in developing countries. Such projects can earn certified emission reduction (CER) credits, each equivalent to one ton of CO2, which can be counted towards meeting Kyoto targets.

The mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction or limitation targets. The range of technologies being considered under the CDM project is wide, and includes renewable energy technologies.

Notably, renewable energy now contributes the largest share of the global project portfolio of the Clean Development Mechanism (CDM), the Kyoto Protocol’s main mitigation instrument for developing countries. It has mobilized significant investment and facilitated the market penetration of advanced renewable energy technologies in many countries (Hoch, 2012).

# Chapter IV: Auditing renewable energy

Currently, the issue of RE has become a very interesting field for the majority of SAI around the world. The increasing number of audit operations conducted on RE during the last decade confirms this trend. Indeed, the audit reports database available at the WGEA website contains more than 40 audit cases related to the RE issues.

In order to study the SAI responses towards the auditing of RE, a questionnaire has been addressed to the WGEA community. 65 SAI responded to the questionnaire which 24 SAI (almost 37%) indicated that they had conduct audits on RE.

Based on the questionnaire results, the aim of this chapter is to explore the different SAI responses to the issue of auditing RE. The analysis will be focused primarily on a brief review of the auditing RE practices. Then, the discussion will be concentrated to identify a hierarchy of recurring topics related to the auditing of RE.

## 4.1. Overview about auditing RE practices

As shown in the table below, the 24 SAIs which reported that they proceed to the auditing of RE arrived to publish together 36 reports during the period 2006-2015. Almost two-thirds of these reports (22 reports) were published by the SAIs of the Nordic countries of Europe (UK, Germany, Finland, Denmark, and Sweden) and the SAIs of North America (USA and Canada). Except for the SAI of Sweden that elaborated only one report, each country has published at least two audit reports during this period.

In addition, the temporary analysis of questionnaire results shows that 72% of 36 reports have been published over the past four years. This confirms that the auditing of RE begins gradually to become a full emerging issue for the different SAIs questioned.

In terms of the preferred types of audit on RE, the majority of SAIs (19 SAIs) has adopted for the performance audit, against only 3 SAIs that made choice of the compliance audit. The general trend towards performance audit is explained by the fact that the SAIs are not restricted to a limited vision based on the verification of compliance and regularity aspects, but adopt a broader view based on the assessment of the 5E dimensions of politics and programs related to the RE.

It should be noted that there is also other types of RE audit that are rarely practiced by the SAI asked, for example: Special Issue Audit (SAI of Korea) and Value for money audit (Slovenia).

|  |
| --- |
| **Table n°x : Audit reports on renewable energy published by SAIs from INTOSAI community** |
|  | **Types of Audit** | **Total audit reports per year** |
| **Compliance audit** | **Performance audit** | **Others** |
| **Year of publication** | **from 2006 to 2009** | Cyprus | Thailand, Canada,Malta |  | **4** |
| **2010** |  | Finland, Lithuania | United Kingdom  | **3** |
| **2011** |  | Finland, Malta, Sweden | United Kingdom  | **4** |
| **2012** |  | Estonia, Australia (ANAO), United Kingdom, USA | Canada, Korea, Germany, United Kingdom, USA  | **9** |
| **2013** |  | Bhutan, China, Meldova, United Kingdom, USA | Germany, United Kingdom  | **8** |
| **2014** | Denmark, Czech Republic | Denmark, ECA, Norway, Poland, United Kingdom |  | **7** |
| **2015** |  | Bostwana, Netherlands |  | **2** |
|  | **Total audit reports per type** | **3** | **25** | **9** | **36** |

## 4.2. Audit topics on renewable energy

By analysing SAIs reports and reports summaries on the WGEA websites, four majors audit topics have been identified[[1]](#footnote-1):

* Public policy on the use of renewable energy sources potential;
* Relevance of public programs and projects on renewable energy;
* Efficiency and effectiveness of measures to promote production and consumption energy from Renewable Sources;
* Linking the use of Renewable energy impact and climate change plan.

### Topic 1: Public policy on the use of Renewable Energy Sources Potential

According to the questionnaire results, many of SAIs questioned provides a significant interest to assess public policy on the use of Renewable Energy Sources. The aim of this topic is to examine the state input into the use of RES Potential, especially through the quality of its objectives, implementation tasks and tools needed to ensure achievement of all its components. We identified 10 examples that directly addresses to this issue:

* SAI of Moldova (2013): The objectives of the state policy on renewable energy;
* SAI of USA (2012): Renewable Energy: Federal Agencies Implement Hundreds of Initiatives;
* SAI of USA (2013): Renewable Energy: Agencies Have Taken Steps Aimed at Improving the Permitting Process for Development on Federal Lands;
* SAI of Malta (2009): Renewable Energy and Energy Efficiency in Malta;
* SAI of Malta (2011): Renewable Energy in Malta – Follow-up;
* SAI of Lithuania (2010): Use of Renewable Energy Sources Potential in Lithuania;
* SAI of Poland (2013): Development and use of the renewable electric energy resources;
* SAI of Estonia (2012): Alternatives for electricity production in Estonia;
* SAI of Denmark (2014): The change of the support scheme for Photovoltaics.

### Topic 2: Relevance of public programs and projects on renewable energy

Some SAIs prefers to conduct audit operations on the RE by focusing attention on programs and projects implemented by National and local governments in this field. The objective of this topic is to evaluate whether the audited programs and projects were implemented and provided results as planned and whether they attained their targets. Three cases studies are identified:

* SAI of Australia (2012): Administration of the Renewable Energy Demonstration Program ;
* SAI of China (2013): Auditing of Energy Conservation and Emission Reduction (Auditing of Golden Sun Engineering Project)
* European Court of Auditors (2014): Cohesion policy funds support to renewable energy generation — has it achieved good results?

### Topic 3: Efficiency and effectiveness of measures to promote production and consumption energy from Renewable Sources

Today, the field of RE has become a fully-fledged business. The development of this business depends on the involving of measures that aim to promote production and consumption energy from renewable sources. These measures take different forms: direct financial incentive, tax incentives… The efficiency and effectiveness of these measures can be an interesting topic of audit by an SAI. Nine cases studies are identified:

* SAI of Netherlands (2015) : renewable energy, the role of SDE+ ;
* SAI of Slovenia (2013) : Effectiveness of measures for efficient use of energy;
* SAI of the Czech Republic (2014) : Management of funds earmarked for the support of energy production from the renewable energy resources ;
* SAI of Norway (2014) : The Office of the Auditor General's investigation of renewable energy licensing ;
* SAI of USA (2013): Wind Energy: Additional Actions Could Help Ensure Effective Use of Federal Financial Support ;
* SAI of USA (2012): Solar Energy: Federal Initiatives Overlap but Take Measures to Avoid Duplication ;
* SAI of Canada (2012) : A Study of the Federal Support to the Fossil Fuel Sector
* SAI of Thailand (2008) : Performance audit on Biodiesel productive system support for small community ;
* SAI of Bhutan (2013): System Audit of Hydro Electric Energy.

### Topic 4: Linking the use of Renewable energy impact and climate change plan

Besides economic and business considerations, the use of RE should lead to mitigate the effects of climate change, mainly by reducing emissions during the cycle of energy production and consumption. Several projects have been implemented in this perspective. A valid topic for auditing is how well RES’s projects do, in fact, meet the necessary requirements established by the national climate change plan. Four examples are identified in this case:

* SAI of Canada (2006) : Reducing Greenhouse Gases Emitted During Energy Production and Consumption;
* SAI of Canada (2009) : Kyoto Protocol Implementation Act;
* SAI of Finland (2010) : Promoting renewable energy ;
* SAI of Finland (2011) : Support for energy and climate technology ;
* SAI of Sweden (2011): Biofuels for a better climate – how is the tax relief used?

# Appendices

## Appendix I: Setting up and / or strengthening national legislation (survey results)

|  |  |
| --- | --- |
| **Countries** | **Setting up and / or strengthening national legislation** |
| **Brazil** | A program to foster alternative sources of energy was created by law in 2004 and is the main initiative in this regard.  |
| **Canada** | The two key pieces of Canadian federal legislation are:**Energy Efficiency Act** - provides for the making and enforcement of regulations concerning minimum energy-performance levels for energy-using products, as well as the labelling of energy-using products and the collection of data on energy use.**Canadian Environmental Protection Act** – provides for regulations to control greenhouse gas emissions, including a requirement to use renewable fuels.Note that legislation and regulations at the provincial level also influences renewable energy projects and plans. |
| **Chile** | Ley 20.257 de fomento a las Energías Renovables No Convencionales establece una meta de un 10-15% al año 2024. Introduce modificaciones a la ley general de servicios eléctricos respecto de la generación de energía eléctrica con fuentes de energía no convencionales.Decreto N° 58: Acuerdo entre la República de Chile y la República Federal de Alemania sobre el proyecto "estrategia de expansión de las energías renovables en los sistemas eléctricos interconectados (con estudios sobre redes)"Decreto N° 59: Promulga el acuerdo entre la República de Chile y la República Federal de Alemania sobre el proyecto "Bienes Fiscales para la generación de energía con fuentes renovables no convencionales"Decreto N° 84: Promulga acuerdo entre el Gobierno de la República de Chile y el Gobierno de la Repúbica Federal de Alemania sobre el proyecto Energías Renovables y Eficiencia Energética IV. |
| **China** | Energy Conservation Law of People’s Republic of China, Renewable Energy Law of People’s Republic of China, Electric Power Law of People’s Republic of China, and Recycling Economy Promotion Law of People’s Republic of China |
| **Costa Rica** | Law No. 449, setting up of the Instituto Costarricense de Electricidad; Law No. 5961, public interest law declaring Geothermal Resources, December 6, 1976; No. 7447, Law on Regulating the Rational Use of Energy, December 13, 1994; Law No 7554, Environment Law, November 13, 1995.Regulation of biofuels, Number DE-35091-MAG-MINAET. March 17th, 2009 |
| **Croatia** | Republic of Croatia has established a basic legal framework for the promotion of renewable energy by adopting revised legislation on the electric energy market and by adoption of the package of secondary legislation for renewable energy which make basic preconditions for real development of renewable energy projects. Also, Energy Act defines the use of energy from renewable sources as national interests of the Republic of Croatia. |
| **ECA** | **EU legislation**Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources. This Directive establishes a common framework in the EU Member States for the promotion of energy from renewable sources, sets mandatory national targets for the overall share of energy from renewable sources in gross final consumption and lays down rules relating to administrative procedures and access to the electricity grid for energy from renewable sources.  |
| **Estonia** | The Renewable Energy Directive 2009/28/EC adopted specific targets for renewable energy in EU Member States, and by 2020 Estonia must raise renewable energy as a share of total energy consumption to 25%, with 2005 as a reference year. More precise targets for renewable sources of energy were set by the Estonian government in Order No 452 of 26.11.2010 of the Government of the Republic of Estonia, ‘The Renewable Energy Action Plan for 2020’ The Electricity Market Act. Act defines renewable sources as water, wind, sun, waves, tidal energy, geothermal energy, landfill gas, sewage treatment plant gas, biogas and biomass. |
| **Greece**  | Law 1559/1985 under which the Public Electricity Company of Greece (D.E.I.), installed 24 MW mainly small wind parks and some low power solar systems.Law 2244/1994, which determines the grid of country fixed prices for electricity produced from Renewable Energy Sources (RES).Law 2941/2001, which simplified the procedures for establishing and licensing companies producing RES and coped successfully with the issue of RES in forests and woodlands. Law 3175/2003, which introduced for the first time a comprehensive set of rules for the use of geothermal energy and introduced simplified procedures concerning expropriations that are necessary for the strengthening and development of electricity transmission lines, which also served the development of RES. Ministerial decrees Δ6/Φ1/οικ.19500/ 4.11.2004 (Government Gazette B´1671), οικ.104247/ΕΥΠΕ/ΥΠΕΧΩΔΕ/25.5.2006 (Government Gazette Β’ 663) and οικ.104248/ΕΥΠΕ/ΥΠΕΧΩΔΕ/25.5.2006 (Government Gazette Β’ 663) under which a) the small sized renewable energy plants switched to zero disturbance making it possible to integrate them in build up areas, b) the overall licensing of RES adjusted into the status of environmental consent process, c) the advisory bodies were limited and short deadlines were established, the lapses without which legitimizes the Agency to consider as positive the interim approvals and opinions of other entities regarding the licensing and installation of RES. Law 3468/2006 which a) established a national goal for the participation of electricity using RES for 2010 at 20.1% and in 2020 at 29% of the gross domestic electricity consumption, b) adopted shorter deadlines within which departments and agencies involved in the various stages of the licensing process of RES should have granted their approval, c) changed the previous single pricing scheme of selling RES, mainly for the benefit of solar systems in order to encourage investment in this sector that showed a significant delay, d) improved the terms of buying and selling of electricity from renewable sources in order to facilitate bank financing of projects, e) raised the limit up to which a hydroelectric project is characterized as a small of 10 to 15 MW, with the result hereinafter more such projects be placed under the guaranteed selling price of energy and priority in the allocation of cargo, f) allowed the licensing of hybrid stations intended to be established in the autonomous island systems without bidding process and enabled the direct billing of energy produced by them in order to avoid the cost of operation of conventional units, which replace the hybrid stations and to ensure the economic sustainability of these stations.Law 3734/2009, which among other established a) the simplification and standardization of licensing of geothermal energy for domestic use (shallow geothermal), b) the expanding of its use in agricultural facilities (greenhouses), c) the setting of a standard and single license and the use of closed systems in areas where boreholes for water are prohibited, d) the amendment of the Ministerial decree on the tendering process for leasing rights research in major geothermal fields, making clearer and fully transparent the procedure.Ministerial decree 1079/2009 (Government Gazette Β 1079/4.6.2009), issued under Law 3734/2009 and laid down rules implementing the Special Program for the Development of Solar Systems in buildings and especially in rooftops. The Project involves the installation of up to 10 kWp systems in homes and small enterprises in mainland System and interconnected islands and applies from the 1 July 2009. This program supports the produced solar kWh, so that a domestic consumer or a small business make a payback for the system installed and have a reasonable profit for services (energy and environmental) that provide to the network. |
| **India** | 1. Electricity Act, 2003 of the Government of India provides for regulatory interventions all over India for promotion of renewable energy sources through:a) determination of tariff; b) specifying renewable purchase obligation; c) facilitating grid connectivity; and d) promotion of development of market.2. National Policy on Biofuels |
| **Lithuania**  | Promotion of the use of renewable energy is one of the key objectives of regulating the activities of the state in the area of energy specified in the Law of the Republic of Lithuania on Energy. Long-term development of the use of energy from renewable sources is provided for in the National Energy Strategy approved by the Seimas of the Republic of Lithuania.  |
| **Morocco** | Law 13-09 on renewable energy Law 16-09 related to the transformation of CDER (Center or Renewable Energy Development) into a National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE)Law 57-09 related to the creation of the Moroccan Agency for Solar Energy (MASEN) |
| **New Zealand** | New Zealand formed an Environmental Protection Authority to consider regulatory approvals for renewable energy projects. The aim was to speed up the decision making process for major projects of that kind. Previously, local authorities were responsible for regulatory approvals. |
| **Norway** | Main legislation ruling the Norwegian energy sector 1. EU legislation is relevant for Norway as part of the EEA Agreement (EU's third energy market package is not yet incorporated into the EEA Agreement).2. The Act relating to acquisition of waterfalls, mines, etc. of 14 December 1917 No. 16 (the Industrial LicensingAct) and related legislation is to ensure that hydropower resources are managed in the best interests of the general public. New licences and licences for transfer of existing licencesare only granted to public-sector purchasers. (more than 95 % of Norwegian power production is hydro electrical)3. The Act relating to the generation, conversion, transmission, trading, distribution and use of energy etc. of 29 June 1990 No. 50 (the Energy Act) sets the framework for organisation of the power supply in Norway.4. The Act relating to renewable offshore energy production of 4 June 2010 No. 21 (the Offshore Energy Act) relates to renewable energy production and conversion and transmission of electric energy offshore.5. The Act relating to electricity certificates of 24 June 2011 No. 39 (the Electricity Certificate Act) is to contribute to increased production of electric energy from renewable energy sources. The Act establishes a Norwegian market for electricity certificates which, from 1 January 2012, was linkedto the Swedish electricity certificate market. |
| **Philippines**  | • Enactment of Republic Act 9513 or the Renewable Energy Act of 2008• Enactment of the Republic Act 9367 or the Biofuels Act of 2006• Issuances of the following IRRs:- IRR of RA 9513- IRR of RA 9367• Issuances of the following Department Circular:- DC no. 2009-07-0010 (Guidelines for the Accreditation of Manufacturers, Fabricators, and Suppliers of Locally-Produced Renewable Energy Equipment and Component)- DC no. 2009-07-0011 (Guidelines for Governing a Transparent and Competitive System of Awarding of Renewable Energy Service/Operating Contracts and Providing for the Registration and Process of Renewable Energy Developers |
| **Poland** | 1. Act of 27 April 2001 – Environmental Protection Law;2. Act of 10 April 1997 – Energy Law; 3. Act of 15 April 2011 on energy effectiveness; 4. Act of 25 August 2006 on biocomponents and liquid biofuels5. Act of 28 April 2011 on trade in rights to emit greenhouse gases;6. Regulation of the Minister of Environment of 27 July 2009 on the types of installations included in the gas emission allowance trading scheme;7. Resolution of the Council of Ministers of 1 July 2008 on the adoption of the national plan of division of authorisations to emit the carbon dioxide for the years 2008-2012 for the community gas emission allowance trading scheme; 8. Resolution of the Minister of Economy of 18 October 2012 on the specific scope of duties to obtain and present for discontinuation the certificate of origin, initial payment, purchase of electric energy and heat produced in the renewable energy resources and duty to confirm data on the amount of electric energy produced in a renewable energy resource;9. Resolution of the Minister of Economy of 25 March 2014 on the conditions and course for the issuing of certificates and accrediting organisers of trainings in the scope of renewable energy resources;10. Resolution of the Minister of Economy of 25 April 2013 on the conditions, way and course of the granting of funds for the execution of activities connected with the production of biocomponents and liquid biofuels and other renewable fuels and their utilization in transport.  |
| **Slovenia** | Action plan on renewable sources of energy for Slovenia from 2010 to 2020Special provisions of the Energy Act providing:• subsidies for investors of installations in which energy from renewable sources is produced;• subsidies for investors to building in the devices run by energy from renewable sources;• subsidized prices for suppliers of electricity from renewable sources. |
| **Turkey** | For the aim of increasing domestic energy production, it was found necessary to privatize generation; distribution and wholesale of the electricity and the first real steps of these privatization efforts were taken with the Electricity Market Law (EML) and Natural Gas Market Law which includes the establishment of an independent marketregulation authority: Energy Market Regulatory Authority.The efforts mentioned above can be seen as prerequisites for Renewable Energy production but the most important development in this way is the enactment of the Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy (Renewable Energy Law) with Law No. 5346 on 10.05.2005. |
| **United Kingdom**  | Climate Change Act 2008 – which has set Greenhouse Gas Emissions reductions targets in legislationEnergy Act 2013 – which gave statutory basis for electricity market reform (EMR). |
| **USA** | At the national level, legislation provides tax incentives for production and investment in renewable energy, including production and investment tax credits for wind, solar, and other renewable projects and excise tax credits for advanced biofuels production.In addition, many individual states have adopted renewable portfolio standards that require or encourage utilities to purchase renewable energy. Further, a number of states provide tax credits, grants, and loan guarantees for renewable energy projects. |

# Appendix II : SAIs case studies

**Topic 1 : Public policy on the use of Renewable Energy Sources Potential**

**2013 : SAI of Moldova : The objectives of the state policy on renewable energy**

**Objectives of audit:**

State energy policy in order to ensure achievement of the objectives of increasing the share of renewable energy is developed enough and adequate and competent authorities in the field (central and local) have sufficient and effective tools to achieve these goals?

**Scope (Lines of enquiry and methodology):**

Audit approach was focused on the issues. We analyzed the objectives of state policy on renewable energy, through the quality of these policies, implementation tasks and tools needed to exercise their existence.

**Audit criteria:**

National legal framework, international agreements

**Audit findings (including audit evidence)   :**

To achieve the objectives for increasing the share of renewable energy, state energy policy needs to be reviewed, updated and supplemented with determination mechanisms and instruments to achieve those objectives and monitoring mechanism to assess progress achievements in the field, as well as providing appropriate financial support.

**Recommendations:**

1 To review and update existing legislation, in order to ensure continuity and sustainability of public policy actions in order to achieve the state policy in the field of renewable energy.

2 To ensure ownership of information structured and generalized types of renewable energy sources concerning their potential for use, in order to determine their suitability recovery.

3 To determine priorities and recovery options on the types of renewable energy sources, identifying and removing barriers that delay the implementation of renewable energy.

4 To develop methodology for data storage and determine how to create a database of information on energy efficiency and renewable energy, indicating the responsibilities of database contents and sources of information.

5 To determine the mechanism and method of monitoring the achievements in renewable energy and the form of reporting on the implementation of plans and programs in the field.

6. Establish a well-defined policy of financing projects in the context of achieving the objectives of the government, determining funding priorities aimed at implementing actions set renewable energy.

**Follow-up or post-audit action by government or SAI (if available):**

SAI of Moldova continuously monitor implementation of the submitted recommendations. Also in the recent initiated audit mission will be analyzed the impact of audit.

**Source reference to Audit report, including website link to full report. If possible:**

**2012 : SAI of United States : Renewable Energy: Federal Agencies Implement Hundreds of Initiatives**

**Objectives of audit:**

Our objectives were to (1) identify federal agencies’ renewable energy-related initiatives government wide, and (2) examine the federal roles these agencies’ initiatives support.

**Scope (Lines of enquiry and methodology):**

To identify federal agencies’ renewable energy-related initiatives, we collected information on initiatives that were funded, planned, implemented, or authorized in fiscal year 2010 by reviewing agencies’ budget documents and other key information sources, such as strategic plans and websites. From this effort, we developed data on agencies’ initiatives that were related to renewable energy through a specific emphasis or focus, even if renewable energy was part of a broader effort. We defined an initiative as a program or group of activities serving a similar purpose or function, and the initiatives we identified included agency spending programs as well as tax expenditures.

In some instances, these initiatives corresponded to distinct agency programs or initiatives. In other cases, we identified and grouped similar activities into initiatives based on our own judgment when there did not already appear to be a formal name for the initiative, or disaggregated higher-level activities that included multiple initiatives. We submitted a structured data request to agencies to provide information on each of their renewable energy initiatives, including the responsible agency component(s); a description of its purpose, how it is implemented, and how it relates to renewable energy; the applicable renewable energy sources; the recipients of funding, services, or other types of support; the extent to which it was established, expanded, or modified by the Recovery Act; and whether the legislative authority for the initiative has expired or may expire. We then conducted interviews with agency officials responsible for providing the data to collect additional information and assess the accuracy, reliability, and completeness of the data provided.

To examine the federal roles agencies’ renewable energy initiatives support, we analyzed the initiative data we collected to identify the federal roles of the initiatives each agency implemented. Specifically, we categorized agencies’ initiatives on the basis of four key federal roles, including (1) research and development; (2) commercialization and deployment; (3) regulation, permitting, and compliance; and (4) fleets and facilities. In some instances, we found that agencies’ initiatives did not fit into any of these four roles, and in such instances, we included these initiatives in an “other” category.

**Audit criteria:**

No criteria; descriptive.

**Audit findings (including audit evidence):**

We found the following:

Governmentwide, 23 agencies and their 130 subagencies GAO reviewed implemented nearly 700 renewable energy initiatives in fiscal year 2010. The Departments of Defense (DOD), Agriculture (USDA), Energy (DOE), and the Interior were collectively responsible for almost 60 percent of all initiatives.

The initiatives supported a range of renewable energy sources, and the most commonly supported sources were bioenergy, solar, and wind. Also, the initiatives supported a range of public and private sector recipients, but the large majority provided support to the private sector. Many initiatives supported multiple renewable energy sources and types of recipients, while many others targeted support to one source or recipient. Agencies’ renewable energy efforts increased in recent years as a result of the provisions of the American Recovery and Reinvestment Act of 2009 and other factors, but the level of future efforts is less certain with the expiration of these provisions and budget constraints.

Across agencies, more than 80 percent of initiatives span four key federal roles—supporting research and development; using renewable energy in vehicle fleets and facilities; providing incentives for commercialization and deployment; and regulation, permitting, and ensuring compliance. Certain agencies led efforts in each federal role: DOE, DOD, and USDA for research and development; DOD, the General Services Administration, and DOE for fleets and facilities; Treasury and USDA for commercialization and deployment; and Interior and the Environmental Protection Agency for regulation, permitting, and compliance.

**Recommendations:**

The audit did not contain recommendations.

**Follow-up or post-audit action by government or SAI (if available):**

None.

**Source reference to Audit report, including website link to full report. If possible:**

Available on line at: <http://www.gao.gov/products/GAO-12-260>.

**2013 : SAI of United States : Renewable Energy: Agencies Have Taken Steps Aimed at Improving the Permitting Process for Development on Federal Lands**

**Objectives of audit :**

Our objectives were to examine (1) the status of renewable energy permitting on federal land, including time frames for processing permits applied for since EPAct 2005; (2) actions the agencies have taken to facilitate renewable energy development on federal land, particularly since the passage of EPAct 2005; and (3) factors affecting renewable energy development on federal land.

**Scope (Lines of enquiry and methodology):**

To determine the status of renewable energy permitting, we administered a questionnaire to BLM officials nationwide, covering all permit applications for onshore wind, solar, and geothermal energy projects submitted to BLM—the agency responsible for permitting almost all applications submitted for renewable energy development on federal lands—from enactment of EPAct 2005 (August 8, 2005) through May 2012. We analyzed information obtained through the questionnaire regarding the status and time frames associated with each application and the factors affecting its processing. We received a 100 percent response rate to this questionnaire. In addition, we conducted semistructured interviews with officials in the nine Forest Service regional offices to determine the status and time frames of renewable energy permitting on Forest Service-managed lands. To determine actions taken to facilitate renewable energy development, we reviewed relevant laws, regulations, and agency policies and guidance. We interviewed headquarters officials from the Department of the Interior and its four land management agencies—BLM, the Bureau of Indian Affairs, the Fish and Wildlife Service, and the National Park Service—as well as from the Department of Agriculture’s Forest Service. We also interviewed BLM officials from four state offices; Fish and Wildlife Service and National Park Service officials from selected regions and field units; officials from all nine Forest Service regions; and officials in the wind, solar, and geothermal research programs at the Department of Energy’s National Renewable Energy Laboratory in Golden, Colorado. We obtained BLM funding and staffing data from the agency’s database, and we assessed the reliability of these data by reviewing the agencies’ internal controls of their data systems and interviewing agency officials; we found these data to be sufficiently reliable for the purposes of this report. To determine factors affecting renewable energy development, we used the results of our questionnaire and also interviewed representatives from industry and environmental groups to obtain their perspectives on the time frames and factors associated with the permitting process, and renewable energy development in general.

**Audit criteria:**

We reviewed relevant laws, regulations, and agency policies and guidance.

**Audit findings (including audit evidence):**

We found the following:

Since passage of the Energy Policy Act of 2005 (EPAct 2005), federal land management agencies—primarily the Department of the Interior’s Bureau of Land Management (BLM)—have received hundreds of applications for utility-scale renewable energy projects and authorized 25 projects: 7 wind, 10 solar, and 8 geothermal projects. Applications for the majority of projects were withdrawn by the applicants or denied by BLM because of insufficient information. Applications for about one-fourth of the projects are still pending with the agencies. Time frames for permitting wind and solar projects ranged from 1.5 to 4 years from receipt of the initial application to approval of the project, with time frames decreasing for applications submitted in later years. For geothermal projects, permitting time frames ranged from 1 to 4 years from receipt of the initial application to approval for construction. In all, for projects applied for since EPAct 2005, BLM has authorized projects with the capacity to generate a total of about 5,450 megawatts of electricity, contributing to the act’s goal of approving projects capable of generating 10,000 megawatts of electricity on public lands by 2015.

Federal land management agencies have taken several steps to foster renewable energy development on federal lands since EPAct 2005. Specifically, these agencies have developed or revised policies aimed at, among other things, improving the renewable energy permitting process, formalized coordination within and across agencies and with state and local governments, and devoted increased resources to processing applications for renewable energy permits. One of BLM’s most comprehensive actions was the completion of programmatic environmental impact statements for renewable energy development, intended to streamline the permitting process. The agencies also took steps to improve coordination through regularly established meetings and development of memorandums of understanding between federal and state agencies. They also added staff and increased funding for this development. For example, BLM tripled its staff devoted to processing wind and solar energy applications. To help ensure that its actions are achieving their intended purposes, BLM issued an instruction memorandum in December 2012 aimed at increasing the efficiency and effectiveness of its renewable energy permitting process.

According to BLM respondents to a GAO questionnaire, industry representatives, and others GAO interviewed, many factors affect the pace of renewable energy development on federal lands. Some of these factors are specifically tied to the agencies’ permitting processes, primarily BLM’s. For example, respondents cited effective coordination among the involved parties and the amount of resources the agency can devote to permitting as factors that facilitated the permitting process. On the other hand, they often cited problems with the quality of applications received as a factor that may hinder or slow the permitting process. Respondents also cited a number of factors outside of permitting agencies’ control that can affect the pace of renewable energy development, such as access to transmission lines (which are often scarce in areas where renewable energy is abundant) and competition from electricity generated using conventional energy sources, such as natural gas.

**Recommendations:**

The audit did not make recommendations.

**Follow-up or post-audit action by government or SAI (if available):**

None.

**Source reference to Audit report, including website link to full report. If possible:**

The audit can be found on line at: <http://www.gao.gov/products/GAO-13-189>.

**2009 : SAI of Malta : Renewable Energy and Energy Efficiency in Malta**

**Objectives of audit:**

This audit sought to:

1. evaluate the process adopted in the development of Malta’s energy policy;

2. determine Malta’s progress with regards to the renewable energy program, the energy efficiency action plan and the implementation of biofuel; and

3. assess the effectiveness of the energy efficiency incentives provided by the Government.

**Scope (Lines of enquiry and methodology):**

Various renewable energy initiatives (Penetration of Photovoltaics, Solar Water heaters, Biofuels, Wind Energy and Biomass)

**Audit criteria:**

European Union and national targets

**Audit findings (including audit evidence):**

At the time, the major findings were summed up as follows:

The consequences of climate change, increasing dependence on fossil fuels, and instability in energy prices have rendered the exploitation of renewable energy sources and the increasing adoption of energy efficient practices as a vital element of the energy policy framework. Additionally, Malta is also obliged to attain challenging EU renewable energy and indicative energy efficient targets. This report, however, has pointed out that the exploitation of renewable energy sources is still minimal. Moreover, this report remarked that, unless policy development and project implementation are stepped up, it would be very difficult for Malta to reach all its renewable energy and energy efficiency targets.

**Recommendations:**

The main recommendations related to the policy formulation process, the further undertaking of research to further exploit renewable energy sources and the strengthening of structures to better monitor progress.

**Follow-up or post-audit action by government or SAI (if available):**

Follow-up audit carried out as indicated on a separate template

**Source reference to Audit report, including website link to full report. If possible:**

<http://nao.gov.mt/page.aspx?id=85>

**2011 : SAI of Malta : Renewable Energy in Malta – Follow-up**

**Objectives of audit:**

This audit sought to:

1. evaluate the process adopted in the development of Malta’s energy policy;

2. determine Malta’s progress with regards to the renewable energy program.

**Scope (Lines of enquiry and methodology):**

Various renewable energy initiatives (Penetration of Photovoltaics, Solar Water heaters, Biofuels, Wind Energy and Biomass)

**Audit criteria:**

European Union and national targets

**Audit findings (including audit evidence):**

Despite delays, significant progress was registered in matters relating to renewable energy policy, including the broadening and strengthening of the biofuel operational and legal framework. Additionally, initiatives relating to renewable energy projects are now gathering momentum.

Delays registered have resulted in Malta progressing only to one third of its 2010 projected RES targets, as indicated in the NREAP. This is not considered to be detrimental to Malta attaining the EU 2020 targets. The progress registered to date and revised plans indicate that Malta will be in a position to fulfil its EU trajectory targets – the first of which falls in 2012 – and ultimately exceed its obligatory 2020 EU renewable energy targets. This is, however, dependant on the current drive being maintained in order to minimise project implementation delays. Moreover, the attainment of Malta 2020 targets remains critically dependent on the feasibility of major projects and that they exploit renewable energy in accordance with the relative projections.

**Recommendations:**

The Follow-up report did not propose further recommendations

**Follow-up or post-audit action by government or SAI (if available):**

Implementation of Renewable Energy Initiatives is ongoing

**Source reference to Audit report, including website link to full report. If possible:**

<http://nao.gov.mt/page.aspx?id=85>

**2010 : SAI of Lithuania Use of Renewable Energy Sources Potential in Lithuania**

**Objectives of audit:**

The audit aim was to examine and evaluate the state input into the use of potential of renewable energy (RES). RES-based Lithuanian energy could be an effective measure not only in solving the urgent problem of NATIONAL energy independence but also in addressing environmental issues (e.g. reducing greenhouse gas emissions).

**Scope (Lines of enquiry and methodology):**

The audit addressed the use of renewable energy sources typical of Lithuania and, in a way, of other EU countries, which can be used for the production of green energy under our local conditions.
Information collection methods, sampling methods, and audit procedures were selected taking into account the audit scope, geographical location of the potential audited entities, and time resources available for the audit. Seeking to reduce the audit risk, the information required for the audit was gathered using the target group approach, in the presence at least three independent sources of information.

**Audit criteria:**

**-** the ratio of the reserve of individual types of renewable energy sources to their actual use;
- compatibility of the development of RES types with the national energy security;
- correspondence of energy produced from renewable sources to the characteristics of green energy;
- comprehensiveness in the use of RES.

**Audit findings (including audit evidence):**

The audit determined that comprehensive use of RES in Lithuania is not ensured due to the following main reasons:

- RES are developed without having revised the National Energy Strategy, although the energy environment in Lithuania, both internal and external, has undergone essential changes after the approval of the Strategy in 2007, such as the decommissioning of the Ignalina Nuclear Power Plant followed by unpredicted rapid increase in prices of fossil fuel.

**-** The quantities and qualities of RES have not been carefully analysed to allow making optimal decisions concerning their use.

**-** The existing procedure for the provision of EU support for the use of RES does not allow increasing its

efficiency.

**-**  The existing promotion measures are not sufficient for the development of RES.

**-** Not all possibilities for promoting RES have been used in adjusting the interests of the producer, the supplier, and the user.

- Priorities and principles of the National Strategy for Sustainable Development of adjusting the

environmental and energy goals are not always followed when using RES.

- Priority is not given to increasing the ‘green’ share in RES-based energy, which this does not allow reducing the country’s demand for fossil fuel. This is especially important in bio-fuel production.

**-** Not all possibilities of Lithuanian science are used in the development of RES.

**Recommendations:**

The audit report provided recommendations aiming at ensuring more favourable conditions to promote the uses of RES: to revise the National Energy Strategy and some of legal acts regulating this area, to improve the system for promoting the use of RES, to increase the ‘green’ share in energy production.

**Follow-up or post-audit action by government or SAI (if available):**

The Prime Minister’s Office and the Ministry of Energy prepared a plan for implementing the audit recommendations

**Source reference to Audit report, including website link to full report. If possible:**

<http://www.vkontrole.lt/audito_ataskaitos_en.aspx?tipas=15>

http://www.vkontrole.lt/failas.aspx?id=2760

**2013 : SAI of Poland : Development and use of the renewable electric energy resources**

**Objectives of audit:**

The assessment of activities of public administration and energy companies undertaken to support

the development and use of the renewable electric energy resources and the effects of such activities

**Scope of the audit:**

**1.** Activities of government administration bodies concerning the preparation and implementation of the renewable energy resources development strategy and support.

2. Execution of the tasks set by the Energy Law, connected with the production of the electric energy out of the renewable energy resources.

3. Activities connected with the recording and use of the funds on the development of the renewable energy resources.

4. Activities of companies concerning the inclusion of the renewable energy resources into the power transmission grids.

5. Activities of the biggest energy companies conducted in order to obtain electric energy out of the renewable energy resources and properly calculate and pay the compensatory payment.

**Audit findings:**

The Supreme Audit Office positively assessed the functioning of the system which is to support the development and use of the renewable electric energy resources and the efficiency of the undertaken activities, although the strategic goals set in the government documents were not fully implemented. NIK stated among others that in the years 2008-2009 the participation of the electric energy produced out of the renewable energy resources in the gross energy consumption amounted to 4,23% and 5,76% respectively, by the planned 5,0% and 6,2%. During this period the production of electric energy out of the renewable energy resources was higher that the forecasted production by more than 10%, but higher than the assumed consumption of the electric energy in total, therefore the expected level of the electric energy out of renewable energy resources was not reached. The amount of the electric energy out of the renewable energy resources produced in 2010 was 10,9 TWh and was almost twice higher than in 2007 (5,23 TWh).

The main strategic goal, set in the Directive 2001/77/EC of the European Parliament and Council, which was implemented, was to achieve in the year 2010 7,5% of the participation of the renewable energy resources in the primary energy balance. According to the audit findings the share exceeded this ratio, reaching 10,2% in 2010.

The revealed irregularities concerned delays in the legislative activities of the Minister of Economy, connected with the preparation of new regulatory rules on the production of energy out of the renewable energy resources. The works on the “National Work Plan Concerning Electric Energy out of the Renewable Resources” and “Report Specifying the Goals in the Scope of Electric Energy Produced by the Renewable Energy Resources Located in Poland” were also delayed. The Minister of Economy did not prepare the work plan for the implementation of the European Parliament and Council directive and did not introduce to one of the operational programmes the support instruments for the investments connected with the construction of installations processing agricultural biogas.

The involvement of the funds from the National Fund for Environmental Protection and Water Management intended to support the development of the renewable energy resources was low, what was caused by among others lack of a proper supervision of the Ministry of Environment over the activity of the Fund.

**Recommendations:**

NIK submitted a recommendation to the Minister of Economy to intensify the legislative works in the scope of the renewable energy resources.

NIK submitted a recommendation to the Minister of Environment to create a supervision system over the National Fund for Environmental Protection and Water Management.

**Source reference to Audit report, including website link to full report. If possible:**

www.nik.gov.pl

**2012: SAI of Estonia : Alternatives for electricity production in Estonia**

**Objectives of audit:**

The report gives an overview of electricity generation in Estonia and strategic development of electricity generation at the state level in an open electricity market in line with the environmental, climate and electricity market policies of the European Union.

**Scope (Lines of enquiry and methodology):**

The National Audit Office wanted to highlight that Governments decisions were based on short-term perspective and did not take into account the long term impacts.

**Audit criteria (questions):**

Which are the important factors affecting the Estonian electricity production in the coming years?

What are the objectives of the Estonian electricity production and planned measures for fulfilling these objectives?

What is the current status of electricity production and development opportunities?

**Audit findings (including audit evidence):**

The state has so far favoured oil shale energy in order to provide Estonian consumers with a lower electricity price and give a competitive advantage to the Estonian economy.

Upon continuing the production of oil shale electricity, the massive inevitable adverse environmental impact must be taken in account.

Construction of new oil shale power plants with state support does not ensure Estonia’s security of supply or an affordable electricity price for consumers in the open energy market.

If the price of the emissions allowances of the European Union rises, the competitiveness of the power plants using oil shale will decrease considerably.

The desired development of Estonian electricity sector should be planned in advance not only for ten years, but for much longer perspective.

**Recommendations:**

The state must plan its energy sector at least 30 years ahead, keeping in mind the principles of an open electricity market, the need to ensure the security of supply, the goals of the EU's climate and energy policies and the expensiveness of the decision for consumers. Therefore, it should be decided

■ how will the supply of electricity in Estonia be ensured in the open electricity market,

■ how much electricity will be generated in Estonia with state or consumer support in the future,

■ whether the state supports the generation of electricity from renewable or non-renewable sources and whether the state prefers to generate electricity in a few large power plants or in distributed power plants.

**Source reference to Audit report, including website link to full report. If possible: English summary is available:** <http://www.riigikontroll.ee/tabid/206/Audit/2264/Area/15/language/et-EE/Default.aspx>

**2014 : SAI of Denmark : The change of the support scheme for Photovoltaics**

**Objectives of audit:**

In 2012 there was a rapid increase in the installed capacity of photovoltaics. This was due to a combination of a generous support scheme an decreasing prices on photovoltaics. The Danish parliament therefore changed the support scheme in 2012/2013 to a scheme that was less generous. However existing photovoltaic installations were given a 20 year transitional period with the old and generous support scheme.

**Scope (Lines of enquiry and methodology):**

Was the Danish Ministry of Climate, Energy and building sufficiently focused on the costs of the support scheme and did the minister of climate, energy and building correctly and sufficiently inform the parliament about the costs.

**Audit findings (including audit evidence)   :**

he Danish Ministry of Climate, Energy and building was not sufficiently focused on the costs of the support scheme and the minister of climate, energy and building did not sufficiently inform the parliament about the costs.

**Source reference to Audit report, including website link to full report. If possible:** http://www.eurosaiwgea.org/Aboutus/Workplan/Documents/5\_2404\_Ostergaard\_Denmark.pdf

**Topic 2: Relevance of public programmes and projects on RE**

**2012 : SAI of Australia : Administration of the Renewable Energy Demonstration Program**

**Objective of audit :**

The objective of the audit was to assess the effectiveness of the Australian Government Department of Resources, Energy and Tourism’s (RET’s) administration of the Renewable Energy Demonstration Program (REDP), including progress towards achieving the programʹs objectives.

**Scope (Lines of enquiry and methodology):**

The audit methodology included examining RET documentation, and interviewing RET staff and members of REC. Submissions were also sought from successful and unsuccessful applicants. All grant applications, including technical, financial and merit assessments were analysed and the audit team visited a number of project sites.

**Audit criteria:**

The audit examined whether the department had established effective arrangements to: implement REDP, including governance arrangements; assess applications for REDP funding assistance and recommend projects to the Minister for funding approval; negotiate funding agreements for approved projects; and monitor progress towards the achievement of the REDP objective.

The audit criteria were based on the requirements of the Finance Minister’s Instructions and the CGGs (as appropriate to the establishment of the program) and informed by the ANAO’s Administration of Grants BetterPractice Guide (2002) and Implementing Better Practice Grants Administration guide (2010—this guide was updated in December 2013).

**Audit findings (including audit evidence)   :**

REDP was the first major program to be implemented by the Australian Government Department of Resources, Energy and Tourism as a new department. At the time that REDP was being implemented (during late 2008 and early 2009) RET was still establishing core departmental functions. The acceleration of REDP’s implementation also meant that grant applications, assessments and decisions had to be completed within a compressed timeframe, adding to the program’s implementation risks.

While recognising the challenging environment these circumstances created, the department did not manage key aspects of the program’s implementation well, departing from generally accepted practices for sound grants administration, which had only recently been reinforced by the release of the Commonwealth Grant Guidelines.

In particular, there were weaknesses in the following aspects of RET’s administration:

\* Program planning—the department did not complete an implementation plan for REDP, nor did it assess the risks facing the program until October 2009, some eight months after the launch of the program;

\* Probity arrangements—departmental records did not indicate the consideration of declarations, by several Renewable Energy Committee (REC) members, of associations with entities, nor the involvement of these members in discussing individual applications for which they had declared a potential conflict. In addition, the department’s probity officer did not observe the committee’s assessment deliberations, nor perform the oversight tasks outlined in the probity plan; and

\* Assessment of applications—the assessment process administered by the department fell short of the transparent and accountable decision‐making processes for grants expected by government, with insufficient documentation retained by the department to evidence key aspects of the process.

**Recommendations:**

Since 2009, when the assessment processes for REDP were undertaken, RET has progressively strengthened its governance arrangements and guidance surrounding the administration of grant programs. This additional governance oversight and enhanced guidance better positioned the department to effectively manage grant programs. There was, however, scope for the department to have enhanced existing materials through greater coverage of the requirements relating to the documentation of merit assessment processes. The ANAO made one recommendation directed to this end.

**Follow-up or post-audit action by government or SAI (if available):**

The agency accepted the recommendation made by the ANAO and indicated in its response to the audit that it had actioned it.

**Source reference to Audit report, including website link to full report. If possible:**

The audit report is available from the ANAO’s website at: <http://www.anao.gov.au/Publications/Audit-Reports/2012-2013/Administration-of-the-Renewable-Energy-Demonstration-Program>.

**2013 : SAI of CNAO : *Auditing of Energy Conservation and Emission Reduction (Auditing of Golden Sun Engineering Project)***

**Objectives of audit :**

*To learn the implementation of the project and the amount of subsidies, and to analyze reasons behind the low progress and poor performance. We also plan to visit the project site and check its construction and operation, and to offer advices on solving problems and fully utilizing the funds.*

**Scope (Lines of enquiry and methodology) :**

*Auditing spot check was carried out on the implementation of the Golden Sun Engineering Project of a province. The installed capacity of the project is 1000kw. The installation and debugging of the project have not finished yet, and some of the finished projects have not yet got connected to the grid.*

**Audit criteria :**

*Relevant laws and regulations, project approval materials, and national PV standard.*

**Audit findings (including audit evidence)   :**

*1. As the construction of local supporting facilities had not been finished yet, some photovoltaic power generation equipments could not be installed. 2. Some completed projects (units) could not be connected to the grids for power generation. 3.The operating losses of the photovoltaic enterprises completed and connected to grid discourage other photovoltaic enterprises from producing or operating*

**Recommendations:**

*1. The supporting facilities should be improved and the projects’ construction needs to be sped up. 2. The grid connection technology should be standardized to ensure the project and the funds give best performance.*

**Source reference to Audit report, including website link to full report. If possible:**

**2014 : ECA : Cohesion policy funds support to renewable energy generation — has it achieved good results?**

**Objectives of audit:**

The objective of the Court’s audit was to assess whether the audited projects achieved good results. More precisely, the Court looked at whether the projects were implemented and delivered outputs as planned and whether they attained their energy production targets.

**Scope (Lines of enquiry and methodology):**

The audit results were derived from an examination of completed renewable energy generation projects from nine operational programmes financed through the ERDF or the CF in Austria, Finland, Malta, Poland and the United Kingdom. The projects were in the biomass, photovoltaic (PV), solar thermal and wind energy sectors.

**Audit criteria:**

In this performance audit on the results achieved by the cohesion policy funds support to renewable energy generation, the Court sought to answer the question whether the two most important funding sources among EU spending programmes for promoting renewable energy – the European Regional Development Fund and the Cohesion Fund – achieved good results.

**Audit findings (including audit evidence)   :**

The ECA found that the audited projects delivered outputs as planned, and most of them were sufficiently mature and ready for implementation when selected. However, the energy production results were not always achieved or not properly measured.

**Recommendations:** The EU auditors recommend that:

(1) The Commission ensure that future Cohesion policy co-funded renewable energy programmes are guided by the principle of cost-effectiveness, including the avoidance of deadweight. Programmes must be based on proper needs assessment, prioritisation of the most cost-effective technologies (while not discriminating between renewable energy sectors) and optimal contribution to the EU renewable energy 2020 target. Adequate renewable energy generation objectives in relation to the budget as well as project selection criteria with a focus on the cost-effectiveness of the energy generation results (avoiding over-compensation of projects) need to be set;

(2) The Commission promote the establishment by the Member States of a stable and predictable regulatory frameworks for renewable energy in general, along with smoother procedures for the integration of electricity from renewable energy into the grid networks; and

(3) The Member States should establish and apply, based on Commission’s guidance, minimum cost-effectiveness criteria which are adapted to the projects’ circumstances. They should also enhance the added value of cohesion policy funds by improving renewable energy project implementation as well as monitoring and evaluation and by building a stock of measured data about energy generation costs in all relevant renewable energy sectors.

**Source reference to Audit report, including website link to full report. If possible:** <http://www.eca.europa.eu/Lists/ECADocuments/SR14_06/SR14_06_EN.pdf>

**Topic 3: Efficiency and effectiveness of measures to promote production and consumption energy from Renewable Sources**

**2015 : SAI of The Netherlands : renewable energy, the role of SDE+**

**Date of the report:**

April, but probably delayed because our organisation just decided not to publish during a period preceding (provincial) elections

**Objectives of audit:**

To evaluate and if possible improve the functioning and effect of SDE+ (the mains financial incentive to promote renewable energy) and in this way make it more probable that the NL will reach the objectives set for 2014 and 2016.

**Scope:**

Effect of the SDE+ scheme, effects and costs in different scenarios

**Methods:**

Survey amongst benificiaries, using theory of Planned Behavior;

Quantitative analysis of the data stemming from the agency carrying out the scheme;

Computer simulation of 10 scenarios (done for us by a specialized organisation);

Limited comparison of the Dutch allocation scheme with prevalent systems in other EU member states+ interviews with European commission;

Interviews with some key stakeholders (e.g. associations of entreprises producing renewable energy)

**Audit criteria:**

The policy that is being carried out should lead to realisation of its aims.

**Audit findings (including audit evidence)   :**

(too early, publication in 2015)

**Recommendations:**

(too early)

**Follow-up or post-audit action by government or SAI (if available):**

(too early)

**Source reference to Audit report, including website link to full report. If possible:**

(too early)

**2013 : SAI of Slovenia : Effectiveness of measures for efficient use of energy**

**Objectives of audit:**

Part of audit was focused on effectivenes of measures to promote use of energy from renewable sources

**Scope (Lines of enquiry and methodology):**

Part of the audit was focused on conducting of measures to promote use of energy from renewable sources

**Audit criteria:**

Goals set in Action Plans

Provisions set in Energy Act

**Audit findings (including audit evidence)   :**

* The set of measures to stimulate consumption of energy from renewable sources was inadequate; There was no comprehensive strategy on stimulating consumption of energy from renewable sources;
* There ware no measures to asses the consumption of energy from renewable sources;

**Recommendations/required corrective measures:**

* To analyse and elaborate possiblities of resources of renewable energy and define optimal amout of subsidies to stimulate consumption of energy from renewable sources;
* Compiling comprehensive strategy on effects and consequences of energy from renewable sporces;
* Elaborate methodology to establish measures to asses consumption of energy from renewable resources

**Follow-up or post-audit action by government or SAI (if available):**

YES – evaluation of required corrective measures:

* an action plan to prepare strategy on effects and consequences of energy from renewable sporces was adopted;
* an action plan to establish measures to asses consumption of energy from renewable resources

**Source reference to Audit report, including website link to full report. If possible:**

Audit report is unfortunately available only in Slovene:

http://www.rs-rs.si/rsrs/rsrs.nsf/I/KD87FA9E2A1CD2378C1257BAA003D570B/$file/UREnergijeSP08-11-A2.pdf

**2014 : SAI of the Czech Republic : Management of funds earmarked for the support of energy production from the renewable energy resources**

**Objectives of audit:**

Examine the provision of funds to support the production of energy from renewable sources, including evaluation of results achieved against objectives and the means employed.

**Scope (Lines of enquiry and methodology):**

Audit was subjected to the funds allocated to support the production of energy from renewable sources. The aim of the audit was to review the provision of funds to support the production of energy from renewable sources, including evaluation of results achieved against objectives and the means employed. All ways to promote savings and energy production from renewable sources were also mapped and evaluated.

- Control of documents, interdepartmental comparison of data

**Audit criteria:**

The main questions were:

Is the promoting the production of energy from renewable sources coordinated in terms of achieving optimal results?

Are the objectives of subsidy programs set up in accordance with the priorities?

Are Funds from grant programs used effectively?

**Audit findings (including audit evidence)   :**

Audit report has not been published yet.

**Recommendations:**

Audit report has not been published yet.

**Source reference to Audit report, including website link to full report. If possible:**

Audit report has not been published yet.

**2014 : SAI of Norway : The Office of the Auditor General's investigation of renewable energy licensing**

**Objectives of audit:**

Norway has committed itself to increasing its share of renewable energy, aiming to reach 67.5% by 2020. Norway’s and Sweden’s common market for electricity certificates is an important policy instrument in this regard, with the shared objective of increasing annual power production by 26.4 TWh from 2012 to 2020. If half of this is to be achieved in Norway, there is a need for measures to promote this goal, emphasises the Storting’s Standing Committee on Scrutiny and Constitutional Affairs. The aim of the audit was to assess to which extent the Ministry facilitates efficient licensing and appeals processing in a manner that promotes a rise in renewable energy production.

**Scope (Lines of enquiry and methodology):**

Investigation period 2009–2013.

Document analysis of licensing applications and appeals, governance instructions, guidelines, etc. Interviews with government agencies and regional authorities, key players. Survey sent to applicants

**Audit criteria:**

EU directive 2009/28/EF and national legislation

**Audit findings (including audit evidence)   :**

Licensing continues to be a time-consuming process; the processing of license applications can be made more efficient.

Requirements to impact assessment lack precision as regards scope and method, licensing is not as efficient as it could be.

Delays and the accumulated licensing case load account for almost 20% of processing time for wind power licensing at the Norwegian Water Resources and Energy Directorate. The accumulation of cases is on the rise. Need for improving procedures for efficient processes.

Need for enhanced governance.

Inadequate grid capacity slows down licensing and development.

**Recommendations:**

Clarifying requirements to impact assessment: update and improve the guidelines for wind power and small-scale power stations so as to arrive at harmonised requirements to impact assessments and a clearly set out methodology.

With a view to concentrating license processing on the most realistic cases, the procedures for rejection in the early stages of the application process should be improved, action should be taken to enhance efficient licensing procedures.

Governance instruments must be enhanced so as to ensure more predictable and efficient licensing. The Ministry of Petroleum an dEnergy should consider drawing up a unified strategy that ensures a co-ordinated effort for renewable energy production and efficient use of governance instruments.

Measures to minimise conflict can be made better use of.

**Follow-up or post-audit action by government or SAI (if available):**

Not available

**Source reference to Audit report, including website link to full report. If possible:**

abbreviated English version:

**https://www.riksrevisjonen.no/en/Reports/Pages/Renewable.aspx**

complete report in Norwegian:

**https://www.riksrevisjonen.no/rapporter/Documents/2013-2014/3\_5.pdf**

 **2013 : SAI of United States : Wind Energy: Additional Actions Could Help Ensure Effective Use of Federal Financial Support**

**Objectives of audit:**

Our objectives for this report were to (1) identify wind-related initiatives implemented by federal agencies in fiscal year 2011 and their key characteristics; (2) assess the extent of fragmentation, overlap, and duplication, if any, among these initiatives, and the extent to which they were coordinated; and (3) examine how agencies allocate support to projects through their initiatives and the extent to which they assess applicant need for support.

**Scope (Lines of enquiry and methodology):**

Our review focused on those initiatives that promoted the research and development, commercialization, or deployment of wind energy technologies in fiscal year 2011, the most recent year for which data were available. To identify these initiatives, we relied, in part, on data from our February 2012 report on renewable energy initiatives, which identified and collected information from wind- and other renewable energy-related initiatives active in fiscal year 2010. Using these data, we focused our review on research and development, commercialization, or deployment initiatives for which wind energy was eligible for support. In addition, we excluded certain agencies—such as the Departments of Defense, Homeland Security, and State—which have initiatives generally focused on development of wind energy and other technologies for use in a military, border security, or available to wind project developers, we collected and analyzed data from the Database of State Incentives for Renewables and Efficiency (DSIRE), a comprehensive source of information on state incentives and policies that promote renewable energy and energy efficiency, which is funded by DOE. We interviewed researchers who developed and maintain DSIRE and determined the data were sufficiently reliable for our purposes. We also interviewed agency officials and financial professionals for additional information on state initiatives.

**Audit criteria:**

Program guidance and regulations for information on how agencies allocate support to projects through the initiatives, and efforts by the agencies to assess applicant need for the support of their initiatives.

Best practices related to government operations related to fragmentation, overlap, and duplication.

**Audit findings (including audit evidence):**

We found the following:

GAO identified 82 federal wind-related initiatives, with a variety of key characteristics, implemented by nine agencies in fiscal year 2011. Five agencies--the Departments of Energy (DOE), the Interior, Agriculture (USDA), Commerce, and the Treasury--collectively implemented 73 of the initiatives. The 82 initiatives incurred about $2.9 billion in wind-related obligations and provided estimated wind-related tax subsidies totaling at least $1.1 billion in fiscal year 2011, although complete data on wind-related tax subsidies were not available. Initiatives supporting deployment of wind facilities, such as those financing their construction or use, constituted the majority of initiatives and accounted for nearly all obligations and estimated tax subsidies related to wind in fiscal year 2011. In particular, a tax expenditure and a grant initiative, both administered by Treasury, accounted for nearly all federal financial support for wind energy.

The 82 wind-related initiatives GAO identified were fragmented across agencies, most had overlapping characteristics, and several that financed deployment of wind facilities provided some duplicative financial support. The 82 initiatives were fragmented because they were implemented across nine agencies, and 68 overlapped with at least one other initiative because of shared characteristics. About half of all initiatives reported formal coordination. Such coordination can, in principle, reduce the risk of unnecessary duplication and improve the effectiveness of federal efforts. However, GAO identified 7 initiatives that have provided duplicative support--financial support from multiple initiatives to the same recipient for deployment of a single project. Specifically, wind project developers have in many cases combined the support of more than 1 Treasury initiative and, in some cases, have received additional support from smaller grant or loan guarantee programs at DOE or USDA. GAO also identified 3 other initiatives that did not fund any wind projects in fiscal year 2011 but that could, based on their eligibility criteria, be combined with 1 or more initiatives to provide duplicative support. Of the 10 initiatives, those at Treasury accounted for over 95 percent of the federal financial support for wind in fiscal year 2011.

Agencies implementing the 10 initiatives allocate support to projects on the basis of the initiatives' goals or eligibility criteria, but the extent to which applicant financial need is considered is unclear. DOE and USDA--which have some discretion over the projects they support through their initiatives--allocate support based on projects' ability to meet initiative goals such as reducing emissions or benefitting rural communities, as well as other criteria. Both agencies also consider applicant need for the support of some initiatives, according to officials. However, GAO found that neither agency documents assessments of applicant need; therefore the extent to which they use such assessments to determine how much support to provide is unclear. Unlike DOE and USDA, Treasury generally supports projects based on the tax code's eligibility criteria and does not have discretion to allocate support to projects based on need. While the support of these initiatives may be necessary in many cases for wind projects to be built, because agencies do not document assessments of need, it is unclear, in some cases, if the entire amount of federal support provided was necessary. Federal support in excess of what is needed to induce projects to be built could instead be used to induce other projects to be built or simply withheld, thereby reducing federal expenditures.

**Recommendations:**

We recommended the following:

To support federal agencies’ efforts to effectively allocate resources among wind projects, we recommend that the Secretaries of Energy and Agriculture, to the extent possible within their statutory authority, formally assess and document whether the incremental financial support of their initiatives is needed in order for applicants’ projects to be built and take this information into account in determining whether, or how much, support to provide. Such assessments could include, for example, information on the investors’ and developers’ projected rates of return on these projects, or documentation of applicants’ inability to secure private financing for projects. In addition, such assessments should consider the financial support available or provided to projects from other federal sources including tax expenditures and, to the extent practical, from state sources. In the event agencies lack discretion to consider this information in determining what financial support to provide, they may want to report this limitation to Congress.

**Follow-up or post-audit action by government or SAI (if available):**

The agencies have yet to implement our recommendations. We are tracking their progress.

**Source reference to Audit report, including website link to full report. If possible:**

The audit can be found on line at: <http://www.gao.gov/products/GAO-13-136>.

**2012 : SAI of United States : Solar Energy: Federal Initiatives Overlap but Take Measures to Avoid Duplication**

**Objectives of audit:**

Our objectives were to identify (1) solar-related initiatives supported by federal agencies in fiscal years 2010 and 2011 and key characteristics of those initiatives and (2) the extent of fragmentation, overlap, and duplication, if any, among federal solar-related initiatives, as well as the extent of coordination among these initiatives.

**Scope (Lines of enquiry and methodology):**

See description on pp. 6-8 and pp. 30-32 of the report. The link is attached below.

**Audit criteria:**

None.

**Audit findings (including audit evidence):**

Sixty-five solar-related initiatives with a variety of key characteristics were supported by six federal agencies. Over half of these 65 initiatives supported solar projects exclusively; the remaining initiatives supported solar and other renewable energy technologies. The 65 initiatives exhibited a variety of key characteristics, including multiple technology advancement activities ranging from basic research to commercialization by providing funding to various types of recipients including universities, industry, and federal laboratories and researchers, primarily through grants and contracts. Agency officials reported that they obligated about $2.6 billion for the solar projects in these initiatives in fiscal years 2010 and 2011, an amount higher than in previous years, in part, because of additional funding from the 2009 American Recovery and Reinvestment Act.

The 65 solar-related initiatives are fragmented across six agencies and overlap to some degree in their key characteristics, but most agency officials reported coordination efforts to avoid duplication. The initiatives are fragmented in that they are implemented by various offices across the six agencies and address the same broad areas of national need. However, the agencies tailor their initiatives to meet their specific missions, such as DOD’s energy security mission and NASA’s space exploration mission. Many of the initiatives overlapped with at least one other initiative in the technology advancement activity, technology type, funding recipient, or goal. However, GAO found no clear instances of duplicative initiatives. Furthermore, officials at 57 of the 65 initiatives (88 percent) indicated that they coordinated in some way with other solar-related initiatives, including both within their own agencies and with other agencies. Such coordination may reduce the risk of duplication. Moreover, 59 of the 65 initiatives (91 percent) require applicants to disclose other federal sources of funding on their applications to help ensure that they do not receive duplicative funding.

**Recommendations:**

None.

**Source reference to Audit report, including website link to full report. If possible:** The audit can be found on line at: <http://www.gao.gov/products/GAO-12-843>

**2012 : SAI of Canada (Office of the Auditor General of Canada) : A Study of the Federal Support to the Fossil Fuel Sector**

**Objectives of study:**

The overall objective of this study is to document the support that the federal government provides to the fossil fuel production sector. The study’s three sub-objectives are to

• identify the policy instruments that provide support to the sector,

• identify the federal programs and activities that support those policy instruments, and

• determine the level of financial support that the identified programs and activities provide to the fossil fuel sector.

**Scope (Lines of enquiry and methodology):**

This study focused on the federal government’s support to the Canadian fossil fuel sector, without applying any one particular definition of the term “subsidy” or any one methodology for measuring such support. Rather, this study included direct spending and tax expenditures based on an inventory approach, without applying the specificity principle.

The fossil fuel production sector includes businesses related to oil, gas, and coal from both conventional and unconventional (oil sands, shale gas) sources. Our work concentrated on the support the federal government provided to all stages of fossil fuel production up to delivery to the consumer—namely,exploration, extraction, transportation, and upgrading/refining. In addition to the operators, we included upstream, midstream, and certain downstream service providers.

We excluded activities related to consuming fossil fuels, including electricity generation, the transportation sector, and energy-intensive manufacturing industries.

For more details, see the full report.

**Audit criteria:** NA. Criteria were not established because this is a study and not an audit. A study differs from an audit in that it is more descriptive and exploratory and does not include observations or recommendations that are directly attributable to the entities.

**Study findings (including audit evidence):** The key study findings are:

• The government has a broad range of programs that provide support to the fossil fuel sector. That support can be grouped into two main types: direct spending through various programs; and tax expenditures under the Income Tax Act, which represent the majority of financial support.

• Based on the data that the government provided to us, the majority (97 percent) of direct spending to support the fossil fuel sector was for research and development, more than half of which related to clean technology. Other direct spending went to economic development activities. Total direct spending amounted to $508 million over the fiscal period 2007–08 to 2011–12. Extended over 30 years, this would represent a significant decline in direct spending support to the sector since the 30 years preceding our 2000 study of government support for energy investments.

• The costs of tax expenditures are not as easily determined as are direct expenditures, due to limitations in data availability and the methodological challenges of developing cost estimates.

• The estimated costs of tax expenditures that Finance Canada was able to attribute specifically to the fossil fuel sector amounted to $1.47 billion over the fiscal period 2006–07 to 2010–11, primarily relating to the accelerated capital cost allowance for oil sands projects. This tax expenditure is being phased out over four years. A number of other tax expenditures are also being phased out over varying time periods. The estimated costs of tax expenditures attributable to the oil and gas, mining, and clean energy sectors as a whole amounted to about $2 billion, accounted for largely by deductions for flow-through shares. Finance Canada was unable to estimate the proportion of this support that was attributable specifically to the fossil fuel sector. For other tax expenditures, such as the accelerated capital cost allowance for mining and Canadian exploration expenses, the Department was unable to provide an estimate of the costs.

**Recommendations:**

None.

**Source reference to study report, including website link to full report. If possible:** The report is found here <http://www.oag-bvg.gc.ca/internet/English/parl_cesd_201212_04_e_37713.html>

**2008 : SAI of Thailand :** Performance audit on Biodiesel productive system support for small community. Department of Alternative Energy Development and Efficiency, Ministry of Energy. ..

**Introduction**

 The government has a supportive policy which encourage the consumption of domestic renewable energy. Bureau of Bio-fuel Development, Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy was proceeding the project; “Biodiesel productive system support for small community” which supported renewable energy consumption under fiscal year from 2005 to 2007 A.D. action plan. There is about 72 participated communities by producing biodiesel fuels from used lard and vegetable oil. .

**Objective of audit :**

 1. To determine whether the “Biodiesel productive system support for small community” project has achieved targets and objective in a sustainable way. .

 2. To find out problems, obstacles and define the solutions to solve the problems. .

**Scope (Line of enquiry and methodology) :**

 Auditing biodiesel productive system support for small community” project under fiscal year from 2005 to 2007 A.D. by sampling 42 from among 72 communities which participated in project. . For the audit methodology, the audit staff used the primary data by questionnaire, interview, observation and secondary data by review documents from DEDE for analysis. .

**Audit Criteria :**

 Department of Alternative Energy Development and Efficiency (DEDE) was operating “Performance audit of biodiesel productive system support for small community” project which objective and target are as follows : . **Objective**

 1. To decrease communities energy expenditure.

 2. To promote and support communities to be self-sufficient and able to produce their energy resources.

 3. To set up the producing and using biodiesel communities model.

 **Target**  Productivity of biodiesel ≥ 200 liters/week.

**Audit findings (including audit evidence):**

The findings of performance audit of biodiesel productive system support for small community project was not accomplished and unsustainable.

 According to the observation of 42 small communities, it was found that productivity of biodiesel had lower than the target and lack of sustainability. The details are shown in the table 1-2. .

**Table 1 : Showing the productivity of biodiesel.**

|  |  |  |
| --- | --- | --- |
| Target achieved  | Under Target  | Total |
| ≥ 200 liters/week | ≤ 200 liters/week | Non Productivity |
| Number of communities | percentage | Number of communities | percentage | Number of communities | percentage | Number of community | percentage |
| 3 | 7.14 | 36 | 85.72 | 3 | 7.14 | 42 | 100.00 |

**Table 2 : Showing the sustainable of the project**

|  |  |  |
| --- | --- | --- |
| Sustainable  | Unsustainable | Total |
| Stable producing | Unstable producing | Not producing at all |
| Number of communities | percentage | Number of communities | percentage | Number of communities | percentage | Number of communities | percentage |
| 14 | 33.33 | 25 | 59.53 | 3 | 7.14 | 42 | 100.00 |

 The productivity of biodiesel had lower than the target and lack of sustainability . because there were not feasibility study and the communities were not ready to proceed and lacked of follow-up the operation from Department of Alternative Energy Development and Efficiency. As a result, most of communities can not reduce energy costs and not . achieved the objective of project.

**Recommendations:**

 OAG recommends that Department of Alternative Energy Development and Efficiency (DEDE) should try to get rid of constraints by taking following actions.

 (a) To prepare the communities before launching the project. For example; training, raising awareness and sharing knowledge about biodiesel.

 (b) To perform the feasibility study before launching a similar project in the future.

 (c) To monitor the project implementation of the communities closely. .

**2013: SAI of Bhutan : System Audit of Hydro Electric Energy**

**Objectives of audit:**

The SAI Bhutan conducted the system audit of Hydro Electric Energy with an overall objective to ‘ascertain the economy, efficiency, and effectiveness in the use of public resources in generating and distribution of hydroelectricity’.

The specific objectives were:

To study the rationality and impact of power tariff revision; and

Ascertain the efficiency and effectiveness of operations of the power utility companies on the quantity of domestic consumption and the dependence on alternative energy supply mix; and To study the environmental aspects of hydropower development

**Sope:**

 The energy audit was primarily focused on Hydro Electric energy. It emphasized on ascertaining the economy, efficiency, and effectiveness in the activities of generating and distribution of hydroelectricity. The audit also covered the environmental aspects of an ongoing and a completed hydro power project, the Puna Tsangchu Hydro Power Project and the Tala Hydro Power Projects respectively. The audit covered the period from 2005 – 2010.

**Audit Methodology:**

1. Qualitative Analysis through the review of procedures, reports, documents and activities

2. Enquiry and confirmation

3. Interviews and discussions

4. Field Visits and

5. Quantitative analysis using secondary data

**Audit Criteria:**

1.The primary mandate of providing reliable, affordable, sustainable, environmentally sound, and efficient energy to raise the living standard of the people and earn maximum revenue by exporting hydropower energy to India should be adequately addressed.

2. All strategies and activities of the Druk Green Power Corporation Limited (DGPCL) and Bhutan Power Corporation Limited (BPCL) should be towards achieving the Missions and Vision of the respective corporations.

3.Provisions of the Electricity Act of Bhutan, 2001 should be adhered to:

Issues related to environment must be adhered in accordance to the Power Sector Master Plan and the related Acts, rules and regulations.

**Audit findings (including audit evidence) :**

1.Inadequacies were noted in the Tariff Determination Rules & Regulations (TDR 2007) which may result in computing inappropriate power tariff by the BPCL and DGPCL

2.At block 3, the rate for LV consumers is higher than the rates charged for HV and MV consumers i.e., for industrial uses. There has also been decreasing trend in per household consumption of energy primarily attributed to annual increase in tariff as revealed from the analysis carried out by the SAI Bhutan;

3.Despite increasing connectivity of hydropower electricity, there is still considerable dependence on other forms of energy such as firewood, kerosene, LPG, etc which may have possible negative impact on the economy (i.e., adverse balance of payments, INR problems etc. ) as well as on the environment;

4.There may be a need for coming up with the preferred policy option on the pricing and domestic use of energy vis-à-vis use of other forms of energy having regard to their impact on the economy and on the environment as well as affordability of citizens at large;

5.Profit of BPCL is significantly driven by annual increase in tariff besides other operational factors. The extent to which the power tariff revisions and other factors such as operational efficiency and volume variances etc have impacted the profitability of the Corporation needs to be analyzed and ascertained for better information, controls and decision making including determining performance based incentive schemes, bonus etc;

6.Due to inappropriate billing limitation imposed by the Bhutan Electricity Authority (BEA), the DGPCL will have to bear the extra cost of importing energy during lean seasons when the import exceeds the allowed import figures computed based on historical average of DGPLC’s power imports;

7.The power reliability determination of the BPCL was inadequate as compared to other countries where it is determined based on several parameters including, SAIFI, SAIDI, CAIDI, CEMMI-4, CELID-8 and MAIFI, and also including all interruptions;

8.There is increasing trend in distribution loss of BPCL and transformation and generation losses of the DGPCL’s power plants and some of BPCL’s Electricity Supply Divisions (ESDs) necessitating further measures to curtail such losses;

9.Existing Guidelines on compensatory reforestation are not adequate requiring appropriate review and improvements;

10. Despite requirement to utilize water resources in a sustainable manner for hydropower generation, and to protect water catchment areas by promoting sustainable agricultural & land use practices and nature conservation works, existing legislations and strategies on the sustainable use of water were found to be inadequate; and

11.Environmental unit was not found established at the Tala Hydro-power Project Authprity (THPA). Besides, there were cases of non-compliance of some of the environmental rules and regulations at Puna-tasangchu Hydro-power Authority (PHPA).

**Recommendations:**

Tariff Determination Regulation 2007 should be reviewed and updated

Impact of tariff revision, volume of energy consumption and operational efficiency on the profitability of BPCL should be analyzed for better pricing and other decisions

Applicable international standards and practices should be benchmarked for power reliability determination and generation/transformation loss trends in Bhutan to enhance the efficiency of the BPCL and DGPCL

The BPCL should ascertain the reasons for huge variations in expenses made on distribution assets of Rural Electrification Projects across the country

Use of electricity should be promoted to encourage gradual reduction in the use of other forms of fuel and reduce pressure on environment

Electricity affordability study or energy poverty study should be conducted

Differences in existing pricing structure between industrial use and LV customers should be reviewed

Adequate guidelines, legislation and strategies should be framed for environmental protection and utilization of water resources for sustained hydropower generation in the long run

All power plants should establish environmental units or the DGPCL should establish and strengthen the Environment Division

**Source reference to Audit report, including website link to full report. If possible:**

<http://www.environmental-auditing.org/tabid/126/CountryId/284/Default.aspx>

**Topic 4: Linking the use of Renewable energy impact and climate change plan**

**2009 : SAI of Canada (Office of the Auditor General of Canada) : Kyoto Protocol Implementation Act**

**Objectives of audit:**

Our overall audit objective was to determine whether Environment Canada can demonstrate that its annual climate change plans meet the requirements set out in subsection 5. (1) of the Kyoto Protocol Implementation Act. Our audit work included three sub-objectives:

1. to determine whether Environment Canada’s annual climate change plans include all applicable elements listed in subsection 5. (1) of the Kyoto Protocol Implementation Act;

2. to determine whether Environment Canada in conjunction with other selected departments can demonstrate whether the information in its annual climate change plans pertaining to selected measures is accurate or based on an adequate rationale; and

3. to determine whether Environment Canada can demonstrate that it has systems in place to monitor and report on the greenhouse gas emission reductions of the selected measures in the annual climate change plans.

**Scope (Lines of enquiry and methodology):** The audit is conducted pursuant to the requirements of the Kyoto Protocol Implementation Act, which came into force 22 June 2007. These requirements are described in subsection 10.1 (1) of the Act.

For each audit sub-objective, we interviewed key departmental officials in the National Capital Region. In addition, we undertook reviews of documentation supplied to us by the departments. Federal organizations addressed in this audit included Environment Canada, Natural Resources Canada, Agriculture and Agri- Food Canada, and Sustainable Development Technology Canada. For sub-objective 1, we focused our analyses on those measures (19) for which expected GHG emission reductions were provided. For sub-objective 2, we selected the following 12 measures in 3 key areas:

• Regulating industrial emissions through the Regulatory Framework for Industrial Greenhouse Gas Emissions;

• Renewable fuels through

• proposed regulations for renewable fuels content,

• scientific research and analysis on biofuels emissions,

• ecoENERGY for Biofuels Initiative,

• ecoAGRICULTURE Biofuels Capital Initiative,

• Biofuels Opportunities for Producers Initiative,

• NextGen Biofuels Fund,

• Pilot program to demonstrate E85 (85 percent ethanol) fuelling infrastructure,

• Agricultural Bioproducts Innovation Program,

• Agri-Opportunities Program, and

• Co-operative Development Initiative, and

• Renewable Power, through the ecoENERGY for Renewable Power program

These audited measures were selected based on the amounts of expected greenhouse gas emission reductions and the amount of money allocated.

For more details, see the full audit report.

**Audit criteria:** The audit criteria were:

We expected that Environment Canada has included all applicable elements (a through f) listed in subsection 5. (1) of the Kyoto Protocol Implementation Act.

We expected that Environment Canada can demonstrate that it has reported accurate information on the implementation of selected measures from the previous calendar year.

We expected that selected organizations

• have established clear and concrete expected greenhouse gas emission reductions for the individual measures,

• have established expected emission reductions that are supported by adequate rationale,

• have systems in place to monitor and report on the performance of the individual measures with regard to expected emission reductions,

• have a quality assurance/quality control system in place for addressing the quality of the data, and

• have established clear roles and responsibilities for implementing the measures and achieving results.

We expected that Environment Canada has systems in place to monitor and report the greenhouse gas emission reductions of the measures in its climate change plans.

**Audit findings (including audit evidence):** The key audit findings were:

• The 2007 and 2008 climate change plans do not include all of the information required under subsection 5. (1) of the Kyoto Protocol Implementation Act. Required information that is missing ranges from the dates that some planned emission reduction measures come into effect, to numerical statements of expected emission reductions from some measures, to whether some measures have been implemented by the projected date.

• Environment Canada could not demonstrate that the emission reductions expected under the Regulatory Framework for Industrial Greenhouse Gas Emissions are based on an adequate rationale. The climate change plans overstate the reductions that can be reasonably expected from the Regulatory Framework during the Kyoto period (2008 to 2012).

• For all three groups of measures we examined, the plans are not fully transparent. For example, they do not disclose how expected reductions in greenhouse gas emissions might be affected by such uncertain factors as future economic conditions.

• While Environment Canada has a system in place to report on Canada’s total greenhouse gas (GHG) emissions, it has no system for reporting the actual emission reductions achieved from each measure in the annual climate change plans—a requirement under the Act. Environment Canada has indicated that the monitoring of actual GHG emission reductions could be technically unfeasible and not necessarily cost effective, and that reductions could be impossible to attribute to a specific measure. However, in the plans prepared to date, the Department has not explained why expected emission reductions can be estimated in advance but actual reductions cannot be measured after the fact for individual measures.

**Recommendations:** The recommendations are:

2.9 Environment Canada should ensure that the next annual climate change plan fulfills all the requirements of subsection 5. (1) of the Kyoto Protocol Implementation Act by addressing the findings in paragraph 2.8, including providing summaries of relevant analyses that were conducted to support departmental positions.

2.19 In accordance with the Kyoto Protocol Implementation Act, the projected greenhouse gas emission levels in Canada for each year from 2008 to 2012 should be reported for each measure in the annual climate change plan. Environment Canada should state its expected greenhouse gas emission reductions for the Regulatory Framework for Industrial Greenhouse Gas Emissions in the years that they are most likely to actually occur, rather than in the years that the payment is made to the technology fund and other compliance mechanisms. If this is not done, the Department should explain why in the next plan.

2.28 Environment Canada and other responsible departments should describe in the annual climate change plans the quantitative or qualitative uncertainties related to the expected GHG emission reductions of each measure. A range of potential emission reduction levels should be presented for the annual plans as a whole and for the individual measures where possible.

2.34 Environment Canada should clearly indicate how it will measure actual emission reductions for each of the GHG emission reduction measures in the plans. Where no such measurement takes place, the rationale should be provided for why expected emission reductions can be estimated in advance but corresponding actual reductions cannot be measured after the fact.

**Follow-up or post-audit action by government or SAI (if available):** This audit was one of a series looking at the Kyoto Protocol Implementation Act. The next was in 2012.

**Source reference to Audit report, including website link to full report. If possible:** The report is found here <http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200905_02_e_32512.html> .

**2006 : SAI of Canada (Office of the Auditor General of Canada) : Reducing Greenhouse Gases Emitted During Energy Production and Consumption**

**Objectives of audit:**

Our audit had the following objectives:

•Determine, through the examination of selected federal government programs intended to reduce the quantity of greenhouse gases emitted during the production and consumption of energy in Canada, whether the federal government can demonstrate that these programs achieved expected results.

•Determine whether the federal government can demonstrate that programs intended to reduce the quantity of greenhouse gases emitted during the production and consumption of energy are contributing, as expected, to the achievement of its broader short-term commitments and long-term goals for greenhouse gas emission reductions.

**Scope (Lines of enquiry and methodology):**

Our examination covered a number of programs and initiatives funded and implemented through NRCan from 2000 to March 2006. Under Objective 1, we examined the Wind Power Production Incentive, the EnerGuide for Existing Houses program, and the Ethanol Expansion Program, each of which were allocated funding of $100 million or more. Before the end of our audit work, the EnerGuide for Existing Houses program was discontinued.

Under Objective 2, we examined programs intended to reduce greenhouse gas emissions associated with the oil and gas sector, advance wind power as a renewable source of electricity, and enhance energy efficiency in homes in Canada.

In carrying out our audit, we interviewed government officials from Natural Resources Canada, Environment Canada, and a number of other departments, and reviewed program files, reports, financial statements, and other documents. As well, we interviewed selected recipients of government funding under the programs audited, provincial government officials who were responsible for similar programs, other key stakeholders, and officials of countries considered leaders in the areas of wind power, energy efficiency, and energy policy. We also undertook field visits to several sites receiving funding.

**Audit criteria:**

Under Objective 1, we focused on two audit criteria drawn primarily from various federal government sources: one criterion related to results and the other related to financial management. In the first case, we expected NRCan to have fair and reliable information on the results achieved by the programs for which it is responsible. In essence, we looked for

•established results indicators and evidence that these were being measured, compiled, and reported on;

•measures that assure the quality of this information;

•measures that identified and managed key risks associated with the programs; and

•adjustments and corrective actions based on analysis of results, performance, barriers, and success factors.

With respect to finances, we expected the Department to have fair and reliable information on all appropriations and expenditures associated with the administration and implementation of the programs for which it is responsible. Specifically, we were looking for

•systems in place that provide financial and management controls, and

•measures that assure the quality of financial information.

Under Objective 2, we expected that, where the federal government has made associations among programs, NRCan has fair and reliable information on how these programs contribute to the achievement of the government's larger goals for greenhouse gas emission reductions. Specifically, we were looking for

•clearly defined common goals and relationships among individual programs;

•performance indicators based on these goals that are applicable to individual programs and their results;

•evidence that performance was measured, compiled, and reported on the basis of these indicators, and determination of the extent to which individual programs are contributing to the achievement of common goals;

•measures that identified and managed key risks influencing the contribution individual programs were able to make; and

•adjustments in the choice of programs on the basis of this information.

**Audit findings (including audit evidence):** The key audit findings were:

•Each of the three programs we examined in detail was funded to reduce greenhouse gas emissions, and they have made progress. As of March 2006, spending on the programs had achieved about 22 percent of the 4.8 million-tonne reduction that NRCan expected the programs to achieve by 2010. However, emission reduction targets for these programs were confusing, making it difficult to determine the actual results that were expected. Further, NRCan did not consistently report publicly on how these programs performed against emission reduction and other targets, making it difficult to hold the Department to account for its results.

•The Wind Power Production Incentive has stimulated investment in Canada's wind power industry during its infancy. The program has made progress toward its targets for electricity generation and greenhouse gas emission reduction, though less than anticipated. NRCan is adjusting the program based on lessons learned, to be ready should additional funds be approved. The Department has yet to lead the establishment of a long-term strategy for wind power in Canada, identifying where governments can be most effective.

•Oil and gas production, particularly the rapid development of Canadian oil sands, is significantly increasing greenhouse gas emissions. Yet few federal efforts are underway to reduce these emissions, and those efforts have had minimal results to date. For its part, the federal government is counting on regulatory and long-term technological solutions to achieve future reductions in this sector. However, it is not leading the way by clearly stating how and to what degree Canada will reduce greenhouse gas emissions when oil and gas production is expected to increase.

**Recommendations:** The recommendations were:

3.27 Natural Resources Canada should lead the development of a wind power strategy for Canada, in collaboration with the provinces and wind industry. The strategy should provide avision for wind power in Canada and identify what governments will do to support it, and over what timeframe.

3.32 Natural Resources Canada should complete the evaluation of the Wind Power Production Incentive that it committed to in 2002. It should also complete a thorough economic analysis to clarify the extent to which the economics of wind power are changing across Canada and whether there are implications for this program.

3.61 Natural Resources Canada, on behalf of the Government of Canada, should make clear to Parliament by the end of 2006 how and to what degree the country will reduce greenhouse gas emissions in the oil and gas sector, both in the immediate and longer term. At the same time, NRCan should develop a corresponding implementation plan.

3.66 Natural Resources Canada should ensure that clear and concrete greenhouse gas reduction targets are established for each of its programs funded for this purpose. The Department should provide clear and detailed information to Parliament about the performance of its programs compared with greenhouse gas emission targets, and the costs incurred.

3.68 Natural Resources Canada should establish consistent practices for financial management and reporting of authorized funding and spending at the program level.

**Follow-up or post-audit action by government or SAI (if available):**

NA

**Source reference to Audit report, including website link to full report. If possible:** The full audit report is here <http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200609_03_e_14985.html> .

**2010 : SAI of Finland : Promoting renewable energy**

**Objectives of audit:**

The main question in the audit was how and what energy and climate policy objectives have been achieved and can be achieved by promoting the use of renewable energy.

**Scope (Lines of enquiry and methodology):**

Written documents and interviews

**Audit criteria:**

Achievement of policy objectives (efficiency), different criteria derived from acts.

**Audit findings (including audit evidence) and recommendations:**

In the opinion of the National Audit Office, the feed-in tariff in its proposed form is not the best possible way to achieve renewable energy objectives from an economic viewpoint. The amount of subsidies is impossible to know in advance and the system will bind public funds long into the future. The audit also found research results according to which replacing fossil fuels with domestic bioethanol or biodiesel production would not reduce greenhouse gas emissions. In the light of these findings producing domestic grain ethanol or rapeseed biodiesel would not make sense from the viewpoint of climate policy. Producing biofuels from crops on a global scale contains the risk of rising food prices on world markets. Using palm oil as a raw material for biodiesel contains the risk of destroying rainforests, thereby accelerating global warming. The National Audit Office considers that adequate attention should be paid to these factors when decisions are made to increase transport biofuels.

**Follow-up or post-audit action by government or SAI (if available):**

Supporting renewable energy has been developed according to the recommendations of SAI. Follow-up report is only in finnish.

**Source reference to Audit report, including website link to full report. If possible:** <http://www.vtv.fi/files/2399/2132010_Promoting_renewable_energy.pdf> (abstract, report is only in finnish)

**2011: SAI of Finland : Support for energy and climate technology**

**Objectives of audit:**

The main question in the audit was how effectively Tekes (The Finnish Funding Agency for Innovation) aid for climate and energy projects has created preconditions for achieving climate and energy objectives and promoted business in this sector. The audit focused on five Tekes aid programmes in the climate and energy sector that were considered representative: the Wood Energy Programme (1999–2003), Climtech (1999–2002), Climbus (2004–2008), Densy (2003–2007) and Biorefine (2007–2012).

**Scope (Lines of enquiry and methodology):**

The audit examined performance management and budget documents, international agreements, Finland’s energy and climate strategy, other policy documents as well as reports, studies and evaluations of R&D programmes.

**Audit criteria:**

Achievement of policy objectives (efficiency), different criteria derived from acts.

**Audit findings (including audit evidence)   :**

The audit indicated that Tekes aid programmes have created preconditions for achieving climate and energy policy objectives, but the aid that has been granted by Tekes to climate and energy projects has not promoted the implementation of climate and energy policy objectives in a significant way. This is due partly to the fact that programmes receiving support from Tekes are broad in scope and extend over several years.

**Recommendations:**

Tekes and the supervising ministry should perform cost-effectiveness assessments to determine whether the results achieved in climate and energy projects are in correct proportion to inputs, so that comparisons can be made between different climate policy instruments.

**Source reference to Audit report, including website link to full report, If possible:**

<http://www.vtv.fi/files/2607/2272011_Support_for_energy_and_climate_technology_abstract_netti.pdf> (abstract, report is only in finnish).

**2011 : SAI of Sweden : *Biofuels for a better climate – how is the tax relief used?***

**Background to the audit**

**Reason for the audit:**

The Swedish government has been able to decide on tax relief or tax exemptions for biofuels since 1995. The purpose of the tax exemption is to contribute to the technological development of more environmentally-friendly fuels in order, among other things, to reduce greenhouse gas emissions from the transport sector. Even though it has proved difficult to reduce emissions from the transport sector, there has been no examination as to whether a tax exemption for biofuels is the best way to reduce these emissions. Previous studies have shown that the tax exemption is expensive and is also a blunt instrument. Recently, the cost of the tax exemption has risen significantly and there is a risk that it will continue to rise.

**Purpose of the audit:** The audit has focused on examining the extent to which the tax exemption for biofuels contributes to the achievement of the climate objectives and at what cost. The audit focuses on how the tax exemption for biofuels is structured and managed, particularly in relation to other policy instruments, and the problems and risks it entails. No specific evaluation of the effects of the tax exemption has been possible because it is not the only support aimed at increasing the use of biofuels.

**Performance of the audit:** The SNAO has reviewed the Swedish government’s decisions on tax relief for biofuels for the 1995–2000 period and the monitoring of the tax exemption carried out by Energimyndigheten [The Swedish Energy Agency] for the same period. The SNAO, with help from Statistiska centralbyrån [Statistics Sweden], has also conducted a survey of owners of green cars to investigate what factors are important when deciding to purchase a green car and when choosing fuel. To illustrate the impact of the tax exemption on the use of biofuels and extent to which the use of biofuels contributes to reducing emissions, the SNAO has put together a compilation of existing statistics and has also carried out calculations of its own. The audit has also been supplemented by interviews in the Government Offices of Sweden and the Swedish Energy Agency, a review of government bills and other material and a review of the relevant EU legislation with the support of EU legal expertise.

**The results of the audit:**

The audit has resulted in the following main conclusions and observations:

***A tax exemption for biofuels contributes towards achieving the Riksdag’s climate objectives – but not at a reasonable cost***

The tax exemption has been necessary to increase the use of biofuels, but is a relatively expensive way of reducing greenhouse gas emissions. Nowadays, virtually all gasoline and diesel contain a low-level blend of biofuels. The tax exemption has been crucial for this development. However, to enable biofuels also to be used in high-level blends such as E85, a mere tax exemption is not enough because investment in vehicles and infrastructure is also required. Sweden is practically the only EU Member State that has created a market for E85. It is not fully clear how emissions from biofuels should be measured. Different studies yield different results depending on the assumptions made. The SNAO has estimated that the use of biofuels may have brought about a reduction in emissions of approximately 0.4 to 1.1 million tonnes of carbon dioxide equivalents per year for 2007– 2009. That reduction represents approximately 1 per cent of Sweden’s total greenhouse gas emissions. However, counteractive effects may mean that the reduction is smaller. The loss of tax revenues resulting from the tax exemption has increased steadily since the year 2000 and currently amounts to around SEK 2 billion per year. The reduction in emissions to which the use of biofuels gives rise therefore involves a cost for the government of around SEK 3 per kg of carbon dioxide reduction. Compared to, for example, the carbon dioxide tax of SEK 1.05 per kg of carbon dioxide, a full tax exemption for biofuels is thus a relatively expensive means of reducing greenhouse gas emissions.

***The government’s management of the tax exemption has not brought about long-term, predictable conditions***

In order to provide long-term, predictable conditions for biofuels, the government has devised principles to serve as a basis for decisions on tax relief. Despite the government’s ambitions, in most cases its decisions on tax relief have related to relatively short periods of time – one to two years – which limits companies’ ability to plan. Also, the government´s reasons for granting tax relief have varied. Different companies have not been treated equally. This unequal treatment is unsatisfactory, not only from the point of view of transparency and competitiveness, but also because technology neutrality between biofuels is not guaranteed, which is desirable from the point of view of effectiveness.

Since the tax exemption has primarily contributed to low-level blending of biofuels, it has also not had any great impact in terms of driving technology forward. Low-level blending is an efficient way to get large volumes of biofuels on to the market quickly, but it does not contribute to the development of new fuels. Therefore, there is a risk that the tax exemption contributes to settling for technologies that are neither long-term nor able to serve as a bridge to long-term solutions. The Riksdag has now decided, in response to a proposal by the government, that the government may continue to grant tax relief for biofuels in special cases without any need for it to relate to pilot projects. However, the government has not made clear in which special cases it intends to grant tax relief for biofuels. Neither has the government released information on what will happen to the tax exemption after 2013, when the approval for Sweden’s State aid expires. Overall, this contributes to unclear rules of the game for companies as well as for consumers.

***The tax exemption for biofuels gives rise to side effects – or counteracting effects***

A tax exemption for low-level blended biofuels in gasoline and diesel will, all other things being equal, contribute to lower prices for gasoline and diesel and therefore to higher consumption of fuel overall. According to the SNAO’s assessment, even a marginal increase in total fuel consumption can cut the reduction in emissions brought about by the low-level blending of biofuels by almost a quarter. There has been a considerable increase in recent years in the number of cars that can run on E85 as well as in the number of fuel stations supplying E85. However, the exemption has not been sufficient to sustain consumption of E85 when the price of gasoline has fallen. In 2009, many ethanol-powered car owners refuelled with gasoline instead of E85 as a result of lower gasoline prices. This leads to an increase in emissions because cars able to run on E85 have higher fuel consumption on average than gasoline-powered cars. If the tax exemption for low-level blending also contributes to lower gasoline prices, this may also counteract the use of E85. The EU does not allow the tax exemption to lead to over-compensation of biofuels relative to gasoline or diesel. Since the tax exemption is difficult to differentiate between different biofuels, the government has solved the problem by making the tax exemption subject to a special customs tariff. The customs tariff means that the highest rate of duty must be levied in order for a tax exemption to be granted for ethanol imported for low-level blending, which favours ethanol produced in Sweden or in the rest of the EU. Since the production cost for this ethanol is higher than for imported ethanol, the tariff leads to a higher cost. This higher cost is not matched by greater climate benefits. The customs tariff thus favours ethanol that brings about lower reductions in emissions at the expense of ethanol that could bring about larger reductions in emissions.

***The government’s monitoring of the tax exemption has been inadequate and insufficient***

The government has not presented any comprehensive strategy for how efforts to promote biofuels should best be designed. Neither has the government monitored and commented on the full extent of the tax exemption and its effects in any of the fiscal bills in recent years. The customs tariff that the government has introduced to address the question of overcompensation entails additional support for domestically produced biofuels. For that reason it is of interest also to follow up the issue of over-compensation and the effects of the customs tariff in other contexts, besides for reporting to the EU. The government has not presented any considerations regarding the effects of the customs tariff on domestic production weighed against the access to cheaper imported, more climatefriendly ethanol.

***The tax exemption is not structured so as to be sustainable in the long term***

It is not considered possible for Swedish production of biofuels to increase to any great extent unless new biofuels are developed. Despite investments in research and development over a long period, the development of new, advanced biofuels has proved difficult. The required reductions in emissions imposed by the EU in order for biofuels to be considered sustainable are also modest compared to Swedish conditions. The requirements are therefore not likely to contribute to the development of new biofuels or make the tax exemption more cost-effective in relation to the climate objectives. Unilateral requirements on biofuels could also mean that emissions move to other products or sectors instead. To reduce emissions at as low a cost as possible, it is important not to aim measures against any specific type of production. If the use of biofuels increases, a continued tax exemption for biofuels will mean that the loss of tax revenues will continue to rise. This may make it less likely that the tax exemption can be maintained in the long term. Neither will Sweden be permitted to retain the tax exemption after 2020 unless EU regulation is changed. The tax exemption for biofuels in existence today is therefore not sustainable in the long term.

**The SNAO’s recommendations**

The SNAO has found no evidence that a tax exemption for biofuels contributes to achieving the Riksdag’s climate objectives at a reasonable cost to society. Neither has the tax exemption stimulated the development of new and more advanced biofuels. It is therefore questionable whether it is effective for the government to continue to grant a full tax exemption for biofuels – at any rate in the way in which the tax exemption has been managed, structured and monitored up to now.

In the 2011 Budget Bill, the government announced an extended tax exemption for low-level blending of biofuels from 1 January 2011. The Riksdag has also decided, in response to a proposal by the government, that the government will be empowered to continue granting tax relief for biofuels in special cases. In view of this, the SNAO puts forward the following recommendations to the government: • The government should improve its reporting and monitoring of the tax exemption for biofuels for the purpose of increasing transparency. • The government should report more clearly on how the tax exemption, in combination with the customs tariff, affects Swedish production, imports and use of biofuels and what effects it entails. • The government should clearly specify the cases in which a tax exemption can be granted to avoid a situation whereby different companies and biofuels are treated differently. • In order to give companies and consumers a reasonable chance to plan ahead, the government needs to make clear in the short term how the tax exemption is to be managed from now on. In the longer term, the government needs to analyse which measures best achieve the climate objectives.

**Source reference to Audit report, including website link to full report. If possible:**

http://www.riksrevisionen.se/PageFiles/13896/RiR\_2011\_10\_Biofuels%20for%20a%20better%20climate\_Anpassad.pdf

# References

Australian Renewable Energy Agency (2013), “What is renewable energy? Available at: <http://www.arena.gov.au/about-renewable-energy/>

Beck, F., & Martinot, E. (2004), “Renewable energy policies and barriers”, Encyclopedia of energy, University of Maryland.

Brunnschweiler, Christa. N. (2010), “Finance for renewable energy: an empirical analysis of developing and transition economies”, Environment and Development Economics, Cambridge University Press.

Fthenakis, V., & Kim, H. C. (2009), “Land use and electricity generation: A life-cycle analysis”, Renewable and Sustainable Energy Reviews.

Global trends in renewable energy investment (2014), Frankfurt School of Finance and Management, 2012. <http://www.unep.org/pdf/Green_energy_2013-Key_findings.pdf>

Governing Clean Development in LDCs: do CDM rules promote renewable energy in Ethiopia? Stephan Hoch, Working Paper 018 – March 2012

INTOSAI WGEA (2010), “Auditing Sustainable Energy Guidance for Supreme Audit Institutions” Available at: <http://www.environmental-auditing.org/LinkClick.aspx?fileticket=4OJVKKGkRzY%3d&tabid=128&mid=568>

KPMG (2013), “Taxes and Incentives for Renewable Energy”.

Krewitt, W., Nienhaus, K., Kleßmann, C. et al. (2009), “Role and Potential of Renewable Energy and Energy Efficiency for Global Energy Supply”, final report on behalf of Umweltbundesamt. Berlin, Germany.

Martinot, E. (2004), “Global Renewable Energy Markets and Policies”, University of Maryland.

Miller, M., Voss, P., Warren, A., Baring-Gould, I., & Conrad, M. (2012). “Strategies for International Cooperation in Support of Energy Development in Pacific Island Nations”, national Renewable Energy laboratory (NREL)

Network, R.E.N (2013), “Renewables 2013: Global Status Report”, Renewable Energy Policy Network for the 21st Century (REN21) <http://www.unep.org/pdf/GSR2013.pdf>

Network, R.E.N (2014), “Renewables 2014: Global Status Report”, Renewable Energy Policy Network for the 21st Century (REN21)

OECD Factbook (2013), “Renewable energy: Economic, Environmental and Social Statistics, OECD publishing <http://dx.doi.org/10.1787/factbook-2013-45-en>

Sandy Goodman & Alex Rislet Schroeder (2014), “ABE Clean Energy Ambassadors Curriculum Resource Guide” Funded by the Massachusetts Clean Energy Center and World Education.

Stover, D. (2011), “The myth of renewable energy”, Bulletin of the Atomic Scientists.

UNEP (2013), “Green Economy and Trade – Trends, Challenges and Opportunities” Available at: http://www.unep.org/greeneconomy/GreenEconomyandTrade

United Nations Environment Programme (2011), “Investing in renewable energy and resource efficiency”.

# Websites

[American Wind Energy Association](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0CCYQFjAB&url=https%3A%2F%2Fawea.org%2FAbout%2Flanding.aspx%3FItemNumber%3D5237%26navItemNumber%3D633&ei=cp6RVLTME8nwUI7pgNAO&usg=AFQjCNEDIpsMod26lJdZ_dI5TGFz6J4Qfw&bvm=bv.82001339,d.d24) website: www.[awea.org/policy](http://www.awea.org/policy/rpsbrief.html)

German energy Transition website: <http://www.volker-quaschning.de/articles>

OECD library website : <http://www.oecd-ilibrary.org/>

Renewable energy world website [www.renewableenergyworld.com](http://www.renewableenergyworld.com)

The United Nations Framework Convention on Climate Change website: [www.unfccc.org](http://www.unfccc.org)

The United Nations Commission on Sustainable Development (CSD) Website: <http://sustainabledevelopment.un.org/csd.html>

Union of Concerned Scientists website [www.uscusa.org](http://www.uscusa.org)

<http://www.reegle.info/index.php?searchTerm=types%20of%20renewable%20energy&site=clean_energy_search&search=Search>

<http://www.renewableenergyworld.com/rea/tech/home>

<http://www.nrdc.org/energy/renewables/>

<http://www.energymatters.com.au/renewable-energy/>

<http://www.epa.gov/statelocalclimate/documents/pdf/epa_assessing_benefits.pdf>

<http://www.dsireusa.org/faq/>

<http://www.nrel.gov/analysis/about_office.html>

<http://www.epa.gov/cleanenergy/energy-and-you/affect/>

<http://ec.europa.eu/energy/renewables/index_en.htm>

Interactions of Policies for Renewable Energy and Climate:

<https://www.iea.org/publications/freepublications/publication/interactions_policies.pdf>

<http://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/how-biomass-energy-works.html>

Renewable energy technologies :

<https://www.unido.org/fileadmin/media/documents/pdf/EEU_Training_Package/Module7.pdf>

<http://www.resource-solutions.org/pub_pdfs/IntPolicy-Feed-in_LawsandRPS.pdf>

<http://www.un-energy.org/activities/renewable_energy/description>

Renewable Energy Policy Options for China :

[http://www.resource-solutions.org/pub\_pdfs/RECs&OffsetsQ&A.pdf](http://www.resource-solutions.org/pub_pdfs/RECs%26OffsetsQ%26A.pdf)

<http://en.openei.org/wiki/International_Renewable_Energy_Agency_%28IRENA%29>

Global trends in RE investment:

<http://www.unep.org/pdf/GTR-UNEP-FS-BNEF2.pdf>

<https://cleanenergysolutions.org/tools/practices/renewables/incentives>

Renewable energy overview:

<https://www.oas.org/dsd/publications/Unit/oea79e/ch05.htm>

Renewable Energy on Tribal Lands:

<http://www.geni.org/globalenergy/research/renewable-energy-on-tribal-lands/Renewable-Energy-on-Tribal-Lands.pdf>

GLOBAL RENEWABLE ENERGY ISLANDS NETWORK:

<https://www.irena.org/DocumentDownloads/Publications/Global%20Renewable%20Energy%20Islands%20Network%20brochure.pdf>

Potential of Renewables in Latin America: [http://www.geni.org/globalenergy/research/renewable-energy-potential-of-latin america/Potential%20of%20Renewables%20in%20Latin%20America-edited-12-16%20\_Letter\_.pdf](http://www.geni.org/globalenergy/research/renewable-energy-potential-of-latin%20america/Potential%20of%20Renewables%20in%20Latin%20America-edited-12-16%20_Letter_.pdf)

 Renewable Energy Activities :

<http://www1.eere.energy.gov/education/pdfs/lesson297.pdf>

<http://www.unep.org/greeneconomy/Portals/88/GETReport/pdf/Chapitre%206%20Renewable%20Energy.pdf>

How Hydroelectric Energy Works :

<http://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/how-hydroelectric-energy.html>

Environmental Impacts of Renewable Energy Technologies:

<http://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/environmental-impacts-of.html>

<http://www.reegle.info/glossary/tree>

<http://www.map.ren21.net/?gclid=CI6Ykrao-b0CFTMetAodrE8AOQ>

[http://www.landartgenerator.org/LAGI FieldGuideRenewableEnergy-ed1.pdf](http://www.landartgenerator.org/LAGI%20FieldGuideRenewableEnergy-ed1.pdf)

1. See appendix II for the detail of examples identified among each topic. [↑](#footnote-ref-1)